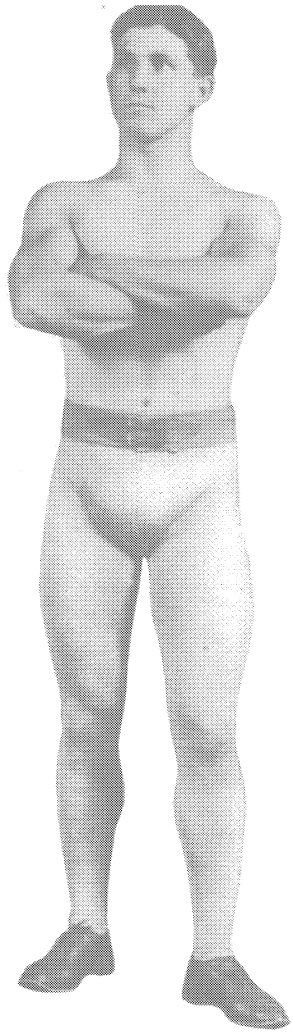
Health, Strength, and Power



NATURAL DEVELOPMENT

HEALTH, STRENGTH & POWER

By

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Illustrated

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The chief essential of physical training is voluntary movement

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Preface

The increasing demands for help from physical exercise by persons subjected to the strains of modern life — a demand which has called forth so many physical culture advertisements — have brought to me a great number of questions concerning the best methods of physical training and the proper maintenance of health. The answers required have been of such a general character and applicable to so many persons that I have thought it advisable to write a popular handbook.

The book is designed to give such hints and suggestions in regard to exercise, diet, bathing, sleep, clothing, etc., as have been shown to be useful by thirty-five years' experience as an instructor of students and adviser of business and professional men, and by twenty-three years' service as a director of a normal school for the preparation of teachers of physical culture.

Illustrations have been especially prepared for this work from numerous photographs of a well-trained model in order to facilitate the learning of the different movements, and exhibit the muscular action involved in a great variety

of free exercises that may be taken without apparatus. Each illustration is also accompanied by a text on the opposite page which describes how the movements should be made, the number of times they should be repeated, and the parts of the body which are thereby most affected.

The author feels confident that the systematic practice of a group of these movements will prove helpful to a large part of the community. They will not only serve as a means of exercise and development for the young and vigorous of both sexes, but they will help restore disordered functions in those more advanced in years, and put them in such a condition of health and fitness as to make work a pleasure and life for itself worth living.

CAMBRIDGE, *July, 1904.* *D. A. S.*

Health, Strength, and Power

CHAPTER I.

THE EFFECTS OF USE AND DISUSE OF THE BODY

ONE of the first facts learned from an intelligent observation of the human body is that parts that are much used tend to increase in size and strength, while parts that are not used tend to diminish in size and strength.

Familiar illustrations are the blacksmith's arms, the pedestrian's legs, the glass blower's lungs and the porter's heart.

An arm that is fractured so that it has to be carried in a sling for a short time soon grows smaller and weaker, and a bad sprain of an ankle causes a like diminution in the size and strength of the muscles of the unused leg.

If this disability continue for a long time the muscles of the arm and leg would become thin and emaciated, and the strength in these parts would gradually diminish until it became little or nothing.

Naturalists tell us that the working of this simple law

of use and disuse has played a great part in the formation and structure of the different species of animals.

For this reason birds have wings, fish have fins, and most land animals have legs and feet or hoofs and claws. These parts are developed by contact with the element and environment in which they are used, and the acts of flying, swimming, or running have contributed to the general formation which we recognize in birds, fish, and four-footed animals.

Man is that animal, however, in which we are most interested, and we must study more particularly his peculiar line of development. If man has ascended from some lower quadruped form of life, — a theory which is now very generally accepted, — his first struggle must have been to acquire an upright position. This seems comparatively simple to us now, but it has probably taken ages to accomplish it. Even now it requires more or less of a conscious effort to hold one's self erect, and most of us are very willing to assume a sitting or reclining posture when an opportunity is afforded.

It is a question whether the abdominal weakness possessed by many men which renders them so liable to hernia, and whether the displacement of the pelvic organs, only too common to women, are not due to a partial failure of the human organism to adapt itself to the upright position.

In the writer's opinion, the tendency to spinal curvature in many cases may be attributed to the same cause.

From an anatomical point of view the assumption of the upright position has been the chief factor in giving man the peculiar form which distinguishes him from all other animals.

When we come to consider the number of muscles brought into action in maintaining an upright position, we find that nearly all of the important muscles of the legs and trunk are used.

In early infancy these muscles are the first to develop, and in approaching old age they are the first to become weak and infirm.

In examining the human skeleton we find also that the size, shape, and peculiar formations and structure of the different bones have been largely determined by the action of the muscles engaged in maintaining an upright position.

Moreover, it has been found that the skeletons of those who were strong and vigorous while living had prominent tuberosities, ridges, and depressions for the attachment of muscles, while those who were weak and poorly developed had skeletons with lighter, smoother, and more regularly shaped bones.

From these observations we infer that the human skeleton has been built up in its present form largely through the action of the muscles which are attached to it.

This conclusion is also confirmed by our every-day experiences. We know that rapid running tends to lengthen the legs, rowing and boxing to lengthen the arms, skating to lengthen the feet, running to shorten them, and swim-

ming to broaden them. On the other hand, heavy lifting or the bearing of heavy weights in youth has a tendency to shorten the legs and flatten the feet, and certain forms of gymnastics, such as the bent arm work on the suspended rings, to shorten the arms.

If the same kind of work was persisted in for a few generations these modifications in the body would become hereditary.

Thus Rengger attributes the thin legs and thick arms of the Payaguas Indians to the fact that successive generations passed nearly their whole lives in canoes, with their lower extremities motionless. Mr. D. Forbes attributed the long bodies, large chests, and short arms and legs of the Aymaras and other races to their having lived for generations at a great elevation where it was necessary to breathe a highly rarefied atmosphere. From these illustrations we are prepared to believe that man as we find him to-day is the resultant of formative influences that have been moulding him for centuries. And that all of the variations and modifications in shape, size, strength, and development that we see in the human figure are due to causes and conditions that have operated upon it in the past, but that are just as effective for improvement or injury at the present time.

Looking at man as a muscular machine, there is probably not a single movement that he is capable of making to-day that has not been made thousands of times before by some of his near or remote ancestors.

When we inquire into the natural history of the muscles of the human organism, the very existence of such groups as are called flexors, extensors, adductors, abductors, etc., implies that they have performed these peculiar functions for ages. A further experimental study of the relative power of these different groups of muscles, reveals the nature of the work they have performed, and the comparative resistance and extent of movement that has given them their present size, strength, and peculiar shape. Unless, therefore, we are prepared to admit that man generically is not as he ought to be, "neither the paragon of animals nor the fashion of the gods," unless we are prepared to create a new being with different muscles, nerves, etc., or are willing that the present one shall become atrophied and withered from disuse, we must from necessity adhere to the same fundamental movements and exercises in our system of bodily training that have brought man to his present state of efficiency and supremacy among the animal creation.

In reviewing the life of man upon the earth, and considering the formative period of his existence, it must not be forgotten that nine-tenths of this period, according to good authorities, is shrouded in darkness; in other words, it is prehistoric.

But no student of evolution believes that man's early life was spent in simply admiring the beauties of nature, or in watching the stars in their courses.

All the evidence we have of the life of primitive man

implies a constant struggle with natural forces, and with wild beasts and savage foes.

These encounters must have severely tested his physical strength and endurance. Those that survived this trying ordeal must have been able to run, jump, and swim, to climb, push, pull, wrestle, and fight; to hurl stones, wield clubs, and to lift and carry their burdens through forest and stream, over rocks and cliffs to their mountain caves.

Within historic times, the progress of civilization has always depended upon the overcoming of material obstacles.

Force has met force, and the energy and strength required in clearing forest, breaking up ground, laying out roads, and in building towns and cities with their numerous trades and industries, have given energy and strength to the masses in return for its efforts.

The problem is to retain our acquired Health, Strength, and Power under the conditions imposed upon us by modern progress.

CHAPTER II.

THE NECESSITY OF PHYSICAL EXERCISE

We have shown in the previous chapter that the bones and muscles of the body flourish in proportion to their use and the nature of their environment, and that the size, shape, and strength of the body thus acquired tended to become fixed for generations through heredity.

Bearing these facts in mind, let us see just how it is that use, activity, or exercise of a part brings about the desired result.

In examining the simplest forms of life, the amœba for instance, we find a single cell, which has no feet, no mouth, no special senses or organs, but absorbs food through its skin directly from the medium in which it is living, just as a primitive savage might pick his food from the earth, water, or trees in the locality where he was living. As animals increase in size they do so largely by the increase in the number of cells that enter into their composition, so that eventually many of these cells are so far away from the surface that they cannot come into immediate contact with their food-supply in the water or air with which they are surrounded.

This necessitates some means of communication and circulation between the exterior and interior of the body, just as a city which is made up of a collection of individuals has to have connection with the sea or country in order to get its provisions.

In a highly organized community like a state or nation, most men have special employments. The farmers raise crops and cattle which the teamsters and railroad men transport to the town or city homes to be prepared and served as food. In return for this service shoes, clothing, tools, and other goods are made by special manufacturers, and sent into the country. This is true in an animal. The higher it becomes organized, the more necessary it is that certain cells shall have special work to do, some to form the skeleton, others the muscles, others the organs of digestion, circulation, respiration, and so on through all parts of the body.

In the primitive forms of society every man is sufficient to himself in so far as he can do his own hunting, fishing, planting, hut-building, tool-making, etc. In a civilized nation to-day one finds it more economical to make shoes or do some one thing well, and trust to others to get his food for him. As a man becomes a good tool-maker, he becomes a poorer farmer, tailor, carpenter, etc., and therefore becomes more dependent upon these tradesmen for the necessities of life. So it is with the different cells and tissues of the body. After they have entered into the structure of bone, muscle or nerve, or become enlisted

in the service of the heart, lungs, stomach, brain, liver, kidneys or some other organ, they learn to do their special work well, but in so doing become less and less fitted for doing the work of other tissues and organs.

In this way each and every part of the body becomes more and more dependent upon some other part for something which it needs to enable it to live and do its work.

The circulating medium which conveys food to all parts of the body is the blood. This is distributed in a set of closed tubes called arteries, which start from the heart and lead through a branching series of smaller tubes to every part of the body, finally becoming so numerous near the surface of the skin that it would be impossible to thrust a needle into the finger without puncturing some of them and causing the finger to bleed.

After ramifying throughout the various tissues of the body, these little tubes gradually converge into larger and larger tubes until they return again in one large trunk to the heart.

This arrangement for distributing blood throughout the body is not unlike that adopted in many cities for distributing water to the inhabitants in their homes, workshops, stores, and factories. In this case the heart is represented by a great pumping-engine which forces the water through a system of iron pipes, first of very large size, as they leave the pumping station, then of smaller size as they branch from the main pipes into the different street connections, and finally through still smaller pipes, that enter

and are distributed throughout the different houses, stores, factories, etc. Of course the demand for water is always greatest in those parts of the city where there is the greatest amount of personal activity or the greatest amount of work being done. Where there is little doing there is little demand for water, and consequently but little used.

At the central pumping station the work of the engine is regulated by the demands for water in different parts of the city.

In case of a large fire or any unusual requirement for water in any ward or district, the engine pumps harder in order to keep up the necessary supply.

So it is in the body; the parts most used call for the greatest supply of blood, and the heart, as a pumping-engine, is stimulated to beat harder in order to meet this increased demand upon it.

Illustrations are familiar to all. If you use your arms freely in raising and lowering two ten-pound dumb-bells for several minutes, the blood-vessels will become dilated, the muscles distended, the skin reddened, and the girths of the arms, as shown by a tape-measure, will be considerably increased.

Now if you will bring your legs into action by raising and lowering your weight on your toes, you will observe the same changes in the muscles of the calves of the legs.

But this change in the circulation of the blood is not confined to the muscles alone.

If engaged for a time in some active mental pursuit, like solving a mathematical problem or writing an essay or an important letter, the blood will be drawn in increased quantity to the head, and the feet will become more or less cold.

The indisposition which every one feels toward doing any active mental or physical work immediately after eating a hearty meal, is occasioned principally by the fact that the stomach is using a large supply of blood to carry on the process of digestion.

This tendency of the blood to go in increased quantity to the organs and parts of the body most used puts it within the power of every individual to direct to a large degree his own growth and development. This is one of the most important facts that man encounters in life.

It gives him his greatest opportunity, and clothes him with his greatest responsibility.

The trend of every man's growth and development is largely determined by heredity. He is in every organ and part as we have seen, the result of what his ancestors have been, and probably one-half of all he can ever expect to attain physically or mentally has been decided at birth. But whether as an individual he ever attains his ultimate size, shape, strength, and capacity will depend upon how well he conforms to the laws and agents of health in regard to exercise, diet, sleep, etc., and with what intelligence he directs and distributes his life-forces.

CHAPTER III.

THE CONDITIONS THAT SURROUND US

In the previous chapters we have seen that the different organs, muscles, and parts of man have been developed through use in the struggles for existence. We have also seen that man has it largely within his own power to direct the nature and extent of his development, in any part, by bringing that part into greater activity, thereby sending to it a greater supply of blood or nutriment.

This implies, of course, perfect liberty on the part of the individual to direct the efforts of his body and mind as he chooses, and it also implies that his environment, which we will consider later, shall be free from noxious influences and tend to promote health.

Unfortunately, most animals, including man, only make such efforts as they feel compelled to make through the stimulus of necessity. The incentive that moves most men to effort is the desire to gain subsistence for themselves and their families. In previous generations, especially in America, a comparatively new country, the efforts

required to earn a livelihood were sufficiently extensive and varied to give vigorous employment to most of the faculties of body and mind.

Clearing forests, erecting houses, breaking up new ground, building stone walls, laying out roads, planting and mowing, interspersed with hunting, fishing, and fighting Indians, furnished our early ancestors with all the physical and mental activity that they needed to keep them in vigorous condition. Agricultural pursuits have always been among the hardiest and healthiest, as were the primitive trades of the carpenter, the blacksmith, the wheelwright, the gunsmith, etc.

As these trades were once conducted, they furnished a man with a great deal of all-round activity. In a previous generation, even professional men lived under conditions that favoured all-round physical as well as mental activity.

It was not an unusual thing for doctors, lawyers, and ministers to be farmers, and for schoolmasters to be surveyors, sailors, mechanics, and "Jacks" at all trades.

In a time when each one did his own hunting, fishing, and farming, his own wood-sawing, chopping, and marketing, and his own making and repairing of tools, houses, and furniture, there was little need of exercise for the health's sake. Now conditions have changed. The advancement of civilization has aroused new interests, and new inventions and discoveries have widened the range

of human possibilities. New industries and manufactures have been created and trade and commerce have been greatly extended.

Steam, electricity, and labour-saving machinery are now doing the world's heavy work, once done by muscle-power, and making it more and more necessary for man to rely for employment upon the development of his brain and nervous system. The keenness of competition has led to the concentration of capital, and a realization of the community of interest and the advantages of specialization has led to an extensive division of labour throughout all the trades, professions, and divers methods of employment.

Division of labour has now been carried to such an extent, that not only do some men work with their brains only, and others with their bodies only, but certain employments, after they have been once learned, require very little effort either of mind or body. It is certainly possible for a man to earn a living at the present time by the use of a very few muscles and faculties. A glance of the eye, a few movements of the fingers, an occasional nod of the head, are all that are necessary to meet the present demands of certain employments.

Many occupations are so restricted in their range of requirements that children can meet them, and some are so nearly automatic that machines are rapidly taking the places once filled by human agency.

Many occupations, although they require very little mental or physical effort, require their devotees to work in such cramped positions and such constrained attitudes that they become doubly injurious in consequence of their interference with the action of the vital organs. In other occupations, although they call for the use of only small parts of the body, such as the fingers and hands, these parts are used so incessantly that they soon become overworked, which leads to various kinds of local palsies, deformities, and nervous collapses. Bookkeepers, penmen, typewriters, pianists, telegraphers, engravers, and seamstresses are included in this class of occupations, and their local cramps and tremors often incapacitate them for long continued service.

The occupations where men are overworked through all-round physical strain are very few. The blacksmith, iron-workers, coal-heavers, brick-carriers, porters, postmen, and professional athletes are frequently grouped with this class; but evidence is wanting to show that these men are much injured by their *work*.

Even men who are subjected to a great all-round mental strain, such as government officials, presidents of railroads, colleges, and banks, superintendents of factories and managers of great manufacturing establishments and great commercial houses, do not suffer as much from the stress of working and living as many of their employees, who work along narrower lines.

According to health statistics, the class that has been

most used up physically by the strain and stress of the times is the professional class.

We have seen that where some parts of the body are not sufficiently used, they suffer from malnutrition, or lack of food; where other parts are overused, they rob the parts unused of their just share of the body's nutriment.

From a physiological point of view, the ultimate results in both cases are pretty much the same, "as undue, imperfect or overdevelopment of any one part, organ, or function throws the remaining organism out of gear, and constitutes a greater or less tendency to disease."

The relation of occupation to disease was exhibited in a very instructive way by the examination of the drafted men during the late Civil War.[1]

This examination showed the condition of men as they were found in daily life, and is a much better criterion than that furnished by the enlisted men, who may be said to represent a picked class in the community.

The diseases of the digestive system were the most frequent cause for rejection among all classes, the mercantile class — merchants, innkeepers, grocers, clerks, etc. — furnishing the largest number of those exempt from this

[1] See "Statistics, Medical and Anthropological, of the Provost-Marshal-General's Bureau, derived from Records of the Examination for Military Service in the Armies of the United States during the late War of the Rebellion, of over a Million Recruits, Drafted Men, Substitutes, and Enrolled Men; Compiled under the Direction of the Secretary of War." J. H. Baxter, A. M. M. D., Washington, 1875.

cause, followed in their order by the professional class, — lawyers, clergymen, physicians, teachers, editors, etc., — the skilled workmen, — represented by carpenters, painters, masons, blacksmiths, plumbers, etc., and the unskilled labourers, as watchmen, fishermen, farmers, sailors, lumbermen, porters, etc.

The rejection from diseases of the circulating system, including the heart and blood-vessels, were next in frequency, and from these diseases the largest ratio of rejections was among the professional class, then the mercantile, skilled, and unskilled classes, in the order named.

Consumption, the bane of our climate, claims the next largest percentage of rejections. The professional class was most frequently exempt on account of the presence of this disease, then the mercantile, skilled, and unskilled classes.

Diseases of the nervous system were found most often among the professional class, then among the unskilled, mercantile, and skilled classes; while disorders of the intellect found the largest number of victims among the unskilled class of workmen, followed by the professional, skilled, and mercantile classes in the order given.

The ratio of men that were rejected from these different classes on account of disease in general was in round numbers 367 per thousand from all occupations, 520 per thousand from the professional class, 479 from the mercantile class, 434 from the skilled, and 348 from the unskilled la-

bourers. From the professional class the largest ratio of rejections was among the editors, being 739.7 per thousand; then followed the teachers, with 739.5 per thousand; physicians, 670; clergymen, 664; public officers, 627; dentists, 548; lawyers, 543; architects, 535; and finally students at the rate of 328 per thousand.

Among the mercantile class the largest ratio of rejections is credited to the brokers, — 670 per thousand, — then the merchants, with 602 per thousand; the upholsterers have 502, which is the largest ratio of rejections from the skilled labourers, and the iron-workers have 189, which is the least.

Among the unskilled workmen, the watchmen were the most frequently rejected, their ratio being 697 to the thousand, while sailors, boatmen, firemen, miners, and soldiers furnish the smallest ratio of those rejected from this class on account of disease. Soldiers, presumably those who had been in the regular service, and passed through many of the trials and ordeals for which all were being tested, were credited with 183 per thousand, which is the smallest ratio of exemptions from all the occupations given; though the iron-workers (who presumably handle heavy weights), with a ratio of 189 per thousand, would seem to be better representatives of the class of men engaged in industrial pursuits.

Before attempting to draw final conclusions from these data, which are very valuable on account of the immense number of persons examined, it would be necessary to

have access to many facts which do not appear to have been brought out by the method pursued.

Undoubtedly some men were induced to select their vocation in consequence of their weakness; others were influenced in their selection by their strength. Nevertheless, the observations were so numerous that the law governing the frequency of error may be left to take care of the exceptional cases, and we shall be warranted in accepting the general conclusions that occupation, with its immediate environment and the habits of living and social condition resulting therefrom, affects the health and vigour of a people very considerably.

That over one half of all the persons drafted during the Civil War from the professional class, and over forty-six per cent. from the mercantile class, and forty-three per cent. from the skilled labourers, should be rejected on account of physical disability and disease, are sad commentaries on our habits and conditions of working and living. Even at the present time over fifty per cent. of all the candidates who apply for admission to the Military Academy at West Point and the Naval Academy at Annapolis are rejected on account of physical inefficiency.

A man's chief claim to a right to vote as an American citizen, which is denied his feebler sister, is his ability to bear arms in defence of his country, yet statistics show that less than one-half of our male population between the virile ages of eighteen and forty-five is considered able to do so.

Is this the price we are paying for our boasted civilization ?

Is the sacrifice of so much health and manly vigour necessary ?

CHAPTER IV.

PHYSICAL FITNESS

If only fifty per cent. of our male population are fit for military service during the vigorous years of manhood, how large a percentage are really fitted to stand the wear and tear of the ordinary occupations of life?

This depends, of course, upon the requirements of the occupation.

We have already seen that the division of labour, while it has undoubtedly increased skill and efficiency and added greatly to the total product of human industry, has robbed man of its beneficent influence as a means of general development.

It is no longer a question of adaptation of the tool and the employment to the man, it is now a question of the adaptation of the man to the tool and the work to be accomplished.

So rapid has been the development of the arts and sciences, with their new inventions, new methods, new processes, etc., that the human organism, as it exists in many families, has not yet had time to adapt itself to the new conditions imposed upon it.

Hence the peculiar susceptibility to certain weaknesses and diseases that characterizes different families and follows the conditions that accompany the pursuit of certain occupations.

Where once a man's occupation kept him in health, he now has to give what strength he has to his occupation, and trust to other resources to make up the deficiency.

To most men, however, occupation is synonymous with life, as it seems to furnish the only means of living. And since the demands of the times are for the skilful and faithful use of a few "talents," instead of the bungling use of many, a large number of our population use but half of their faculties, and if they pursue the same employment for a term of years, they are apt to acquire defects of structure, if not of constitution and character, that are transmitted to succeeding generations. Thus we have going on in our midst a process of physical deterioration resulting from the overuse of a few muscles and faculties and the under use of the rest. A sort of local starvation is taking place, for want not so much of plenty of food, but of proper distribution of that food throughout the whole organism, which it is one of the provinces of active labour to bring about.

There are thousands upon thousands of persons earning their daily bread who never have occasion in their occupation to use the muscles of the upper part of the body Few ever have occasion to raise their shoulders or to lift their arms above their heads. Yet it is difficult to see

how the vital processes of respiration and circulation can be well carried on without the frequent use of the muscles about these regions. If one would know how much this local starvation of the body costs when accompanied by unfavourable external environments, it may be stated that the difference in the physical status of the Scotch agricultural population and the manufacturing population of the cities of Sheffield and Bristol, in England, is an average of *five inches* in height, and *thirty-one* pounds in weight in favour of the farmers.

This difference in stature and weight is not confined to the farmers and those who work in factories. The English Anthropometrical Association showed by their investigations that growth and development receive a check as we descend lower and lower in the social scale, and that a difference of five inches exists between the average statures of the best and the worst nurtured classes of children of corresponding ages, and three and one half inches in adults.

It was the realization of the deterioration in physique among the applicants for the army from the lower middle classes, that stirred England to her foundations during the recent war in South Africa.

Yet the political economists tell us that the deficiencies of occupation, due to the division of labour and the want of suitable environment to work and live in, are made up by the training of our schools, the establishment of parks and playgrounds, free reading-rooms, bath-houses, libraries,

concerts, etc. These are all very well in a way, and are doing much to enlighten the masses and improve their condition; but the one thing that our people need above all others, to enable them to meet the demands of our civilization, is a thorough system of physical education, carried on through all the school grades and adapted to the organic needs of the individual.

Happily for us, the country is awakening to the importance of this subject, and is putting forth efforts in several directions towards the attainment of better physiques among our people. The principal lines along which this interest in physical training has been developing are represented by our universities, colleges, secondary schools, and Christian Associations.

The establishment of boys' clubs, social and industrial unions, boat clubs, city athletic clubs, and municipal gymnasiums has done a great deal to further the same purpose, while tennis, golf, and the bicycle have allured thousands to physical exercise who never would take it for its own sake, and who consequently never knew what it was to be well and strong.

The reader may say this artificial system of physical training is all very well where gymnasiums abound, and well-qualified teachers are employed to direct them, or where one can afford the luxury of belonging to a boat, tennis, golf, or city athletic club, but what can be done for the physical improvement of the general public, to whom these opportunities are not available?

Unfortunately for the advancement of the race, this question can be applied with almost equal force to the mental and moral improvement of a large portion of our people. The churches, schoolhouses, and libraries do not reach all the members of a community in an effective way, and the problem is how to make the influence of these institutions felt among that class where it is most needed.

Here the best results are accomplished by arousing an interest on the part of the individual in himself.

So it is with physical training. When once a man has become thoroughly convinced of its importance to his own physical well-being, half the battle is won, and henceforth his life may be so ordered that even his labour will be made to contribute to his personal improvement.

The writer recalls his own experience as a boy in this direction. Having become interested in the laws of health through reading a school physiology, and being deprived by circumstances of an opportunity to cultivate the body systematically, he resolved to make his labour contribute to the development of his physique.

Henceforth, going up and down stairs was simply a means of strengthening the muscles of the legs. Lifting weights and bearing burdens were approved ways of developing the muscles of the back and loins and strengthening the arms and shoulders. Ploughing, mowing, raking, pitching, hoeing, chopping, digging, hoisting, and all the diversified forms of labour that fall to the lot of the country boy, were classified according to their specific

effect in developing certain muscles of the body, and were entered upon with something of the same zest with which one would engage in a course of systematic exercise. The proud consciousness that I was improving my physique and adding to my strength and vigour lightened the burden of labour, and afforded me great satisfaction.

I believe that many a young man who cannot enjoy the privileges of athletic clubs and gymnasiums still has it in his power to do much to improve his physique. The idea that the work that one engages in must be necessarily interesting in itself in order to be beneficial is erroneous. It is true that one is more likely to enter with enjoyment and enthusiasm into the work in which he is interested, but if one gives his physical efforts, his *attention*, whether it be at work pounding iron on a blacksmith's anvil or driving stakes for amusement, the benefit will be in proportion to the muscles exercised and the effort made, provided this activity is kept within the physiological limits. As a matter of fact, some of the most prominent athletes in our colleges and city gymnasiums laid the foundation for their strength and agility while doing farm work or engaging in some form of manual labour that gave them all-round exercise.

College coaches and trainers are always on the lookout for strong and vigorous men for their athletic teams, yet until recent years few men coming to college had ever practised any form of athletics. But wherever we find a

good physique, we know that that individual or his immediate ancestors have given extended employment to their muscular systems, through labour or exercise, and that their physical efforts have been supplemented by right habits of living.

The best plan, therefore, is to regard exercise as one of the important agents of health, and treat it with as much consideration as the subjects of food, sleep, bathing, clothing, etc., which we shall consider later.

Join a gymnasium or some form of athletic club, and enjoy all of the sports in their season, but if you cannot avail yourself of any of these privileges, do not despair of doing something for your physical improvement.

Remember that it is the kind of efforts that one makes hundreds of times a day that affects the constitution favourably or unfavourably, and not the spasmodic efforts that are made once or twice a week.

How important it is, therefore, that the simple matter of attitude or position at work should receive careful attention!

A faulty position, while standing or sitting, not only cramps the vital organs and interferes with the important functions of respiration, circulation, and digestion, but also weakens the muscles that are kept almost continually on the stretch during the working hours. Cramping the vital organs renders the system more susceptible to disease, and weakening the muscles of the back and neck is the principal cause of many of the deformities of

the chest so frequently seen among the student and industrial classes. The only way to prevent and remedy these defects is to so develop the muscles that are attached to the trunk that they may hold the head and body erect.

There is no easier way of accomplishing this object than by repeatedly trying to assume an erect attitude while sitting, standing, and walking.

These local efforts should be supplemented by a series of all-round constitutional exercises, for constitutional effects, which may be practised for fifteen minutes daily as the opportunity presents itself. By pursuing such a course one may not only make up for the developmental defects of one's occupation, but it is possible to attain a fine physique, keep in good working condition, and fortify the system against the incipient forms of disease.

CHAPTER V.

FREE DEVELOPING EXERCISES WITHOUT APPARATUS

In devising a system of exercises without apparatus for home use, I have endeavoured to attain several essential requisites: —

First, that the exercises selected shall tend to correct the special defects and deformities that accompany many occupations;

Second, that many of the exercises shall contribute to the all-round development of the body;

Thirdly, that most of the exercises selected shall tend to give *organic vigour* to the individual as well as strength to the muscles;

Fourthly, that most of the exercises selected shall cultivate the power of producing objective as well as subjective effects.

Corrective Exercises. — Many of the common defects and deformities, such as drooping head, round shoulders, flat chests, etc., result from a weak and relaxed condition of the muscles whose office it is to move and support these parts. If the head is constantly bent forward, as when studying or working at a table, bench, or desk, the

muscles on the back of the neck gradually lose their tone and stretch out as does a piece of elastic cord that is supporting a weight continuously. This stretching of the muscles that usually support the head in an upright position allows the head to droop or incline forward, and unless the muscles regain their tonicity through appropriate exercise, the defect of a "drooping head" is likely to become a permanent one.

This special defect may easily be overcome by systematically practising any vigorous exercise that draws the head upward and backward repeatedly, followed by brief intervals of rest. One very good exercise for this purpose is to recline upon the floor, face downward, and raise the head upward as far as possible. There are many others.

It will be observed that in this case the attention is devoted to one part of the body, that of the head, and all of the energy is concentrated upon getting it upward and backward. This is the essence in all corrective work, and the result aimed for is essentially local.

Upon further observation, however, it will be found almost impossible to produce strictly local results without the coöperation of other parts. For instance, getting the head back to its normal position, after it has become drooped, implies the gradual stretching of the muscles of the front of the neck, chest, and abdomen, and the gentle toning up of the muscles of the spine, buttocks, and back of the thighs and legs.

Similar coöperative or concordant changes in other parts of the body would accompany the correction of any other local defect or deformity. The body is so well poised upon a pillar of separate bones, that anything that disturbs the balance or equilibrium of one part disturbs the equilibrium of all other parts, and a new adjustment of the different proportions of the body has to be made.

So firmly have I become convinced of this fact, and the tendency of the body under normal conditions to assume its normal shape, that I think the attempted correction of any local defect should be supplemented by an all-round development of the entire muscular system.

This all-round development may best be attained without apparatus by throwing the body into such attitudes as require great general effort of the muscles of the trunk and limbs to get into, get out of, or sustain. With the human body, as with any material body, the nearer it gets to a horizontal position, the more difficult it is to get it into a vertical position again. The parts of the body used and the number and variety of the muscles engaged depend, of course, upon the positions assumed, while the speed and energy with which the attempts to get into and out of these different positions are made, measures the intensity of the exercise.

In most free exercises the limbs are used for weights or resistance. In a man weighing 150 pounds, the arms usually weigh about ten pounds each, and the legs twenty pounds. Where the arms and legs are used

separately, much may be done to develop them by free work, as by dumb-bells and weights, by giving sole attention to the parts to be developed.

The principal objection to this method of development is, that the results attained are not only largely local, but inevitably tend to remain so. The only way to develop muscle is to increase its nourishment by sending more blood to it. This is the chief object of bringing a muscle into action and concentrating the mind and energy upon it. But the heart is the principal organ involved in sending an increased supply of blood to a part after the lungs and stomach have contributed their life-giving properties. Though it is possible, therefore, for a man to attain a good general development by developing one part at a time, the strength acquired through this method is often local rather than general or constitutional. A person who has acquired his general development in this way is very much in the same condition as a factory which is supplied with a great many different machines of greater or less capacity. Under ordinary circumstances only a few of these machines are used at one time, and the engine and boiler have been constructed to meet the demands of these few machines. If the occasion ever arises for using a larger number of these machines at the same time, the power of each one will of course be greatly lessened, and consequently the working capacity of each machine will be greatly reduced. So with the locally developed man; if he ever wants

to run, row, swim, or engage in any exercise calling for the use of a great many muscles at the same time, he will find the power of each group of these muscles very much reduced.

Although exercises requiring the use of but few muscles at a time may be advisable in case of a weak heart or weak lungs in a debilitated person, they are not the exercises that are most advisable to practise where the aim is to strengthen and invigorate these important organs.

This brings us at once to the consideration of the kind of exercises that are necessary to practise in order to cultivate organic vigour. By organic vigour I mean the vigour of heart, lungs, stomach, brain, and supporting tissues necessary to meet the vital demands of the whole system.

When we use a few muscles at a time, as in moving a single part of the body, as an arm or leg, it is possible to make so much exertion with these muscles as to exhaust them completely. On the other hand, if the whole body is engaged in the effort, the respiration and circulation will be so much increased that we shall be much "distressed for breath" and have to stop long before we can bring about the exhaustion of the muscles. The power to continue the general effort for a long time, or until complete exhaustion follows, may be termed organic vigour.

This may be cultivated to some extent by practising exercises which, though requiring the use of comparatively few groups of muscles, may be done so rapidly,

energetically, and persistently as to bring the heart and lungs into great activity, as bicycling, dancing, etc. Even in these exercises great speed and prolonged activity generally involve the use of many more muscles than are used ordinarily, and increase of speed and long continuance of effort also tend to bring greater strain on the nervous system. Generally the more muscles and tissues involved in the exercise, the greater the action of the heart. The best exercises, therefore, for invigorating the heart and lungs and improving the entire organism, are those that bring large groups of muscles into action, like rowing, running, swimming, etc.

If these exercises are done slowly, and according to a certain rhythm, for a considerable time, the results are most favourable. The heart, though at first quickened by these exercises, is eventually made to beat more slowly, regularly and powerfully, and is less disturbed by any sudden and unexpected call upon it.

The practice of gymnastics and the concentrated form of free exercises tend largely to the development of muscular power; while the practice of athletics, especially running, rowing, swimming, etc., tends rather to the cultivation of respiratory and circulatory power. What is needed is a more harmonious blending of the practice of both gymnastics and athletics.

Many of the exercises selected for this book have been chosen for the purpose of cultivating organic vigour and good staying power, as well as muscular strength.

The waves of popular enthusiasm for muscular development that have swept over the country during the past few years have induced some overzealous persons to advocate strongly certain "quick and ready methods" of attaining the desired result. The method which has been most extensively advertised, and which has received the most attention, is that which advises the concentration of the will upon the muscles to be developed, and the simultaneous resistance of the muscles opposed to their contraction. To use a familiar phrase, what is true about this method is not new, and what is new is not true.

Every schoolboy is familiar with the fact that, by concentrating the mind upon the biceps and slowly flexing the forearm toward the shoulder, the biceps muscle becomes larger and firmer than when it is in a passive state. Apply this principle to the other muscles of the arms, legs, and trunk, and you have the essence of the concentration theory in a nutshell. Now if you will place the fingers of your left hand on the biceps of your right arm, and the thumb on the triceps or back of the arm, and flex the forearm, while trying to keep the whole arm as stiff and rigid as possible, you will be conscious of two facts. First, the muscles on the back of the arm will be hard and tense, as well as those on the front of the arm, and secondly the whole arm will be more or less immobile.

If two forces act upon a body, one pulling one way and the other in the opposite direction, the body will move slowly and reluctantly toward the force which is the

stronger. If the forces exactly balance each other, the body will not move at all.

There is no doubt that, by concentrating the mind upon a group of muscles, during their action, the blood may be made to flow more freely to those muscles, and thus tend to improve their nutrition and development. So standing in front of a looking-glass, and becoming for the time being a devoted admirer of one's own physique, will through some psychic influence help to the realization of the desired object. By repeatedly contracting and relaxing the different muscles of the body, while under the influence of this psychic stimulus, a more direct communication between brain and muscles seems to be established, and as a preliminary introduction to other exercises, this method is unobjectionable.

But when one devotes too much time and attention to these self-centred movements, he is likely to become, if not vain and egotistical, extremely conscious of his many muscles, and this very consciousness, when he attempts to effect something outside of himself, may lead to his embarrassment. It is very difficult to concentrate the attention upon more than one group of muscles at a time, yet the practice of fencing, boxing, tennis, and many skilled sports requiring mental alertness, brings many groups of muscles into action almost simultaneously. In practising such exercises and most athletic sports, the mind must be given directly to the goal to be won, or the thing to be achieved. Any attention given to the

muscles engaged in the separate movements would be a hindrance instead of an assistance. Concentrate the attention upon the muscles of the right arm and shoulder and try to throw a ball at a target, and see what the result is.

If the preliminary practice has called for the contraction of antagonistic muscles, as a means of resistance, the arm and shoulder will feel very much as though they were bound with straps or cords, that make freedom of movement very difficult. This is what is sometimes termed being "muscle bound," and unfits one for the practice of any skilled sport. The contraction of antagonistic muscles makes one stiff, staunch, and strong, but it is not the kind of strength that is serviceable. In competitive games one so trained spends much of his energy in competing with himself, as it were. In training men for the practice of skilled sports, one of the first essentials is to teach them to *relax*, and not to contract antagonistic muscles.

Many of the exercises introduced in this book are especially designed to cultivate the power of externalizing oneself, as it were, and of throwing all of one's strength and purpose into the work to be done. By this method of exercising, the action of the different muscles will follow each other in regular sequence, and an ease and grace of movement will be acquired that will readily be appreciated. Although the specific thing to be done is largely imaginary, the effort to do it may be real, and the self-discipline acquired by holding oneself down to a steady line of physical work of this kind is of the utmost value.

CHAPTER VI.

THE PHYSICAL NEEDS OF CHILDREN

No one who has had the care of children will question the difficulty of trying to keep them still. From the earliest infancy, there is an almost uncontrollable desire for movement.

Watch an infant in his crib when freed from the restraints of clothing. How he kicks out with his legs, strikes out with his arms, and clutches with hands and feet at every object that comes within his reach. Moreover, every movement seems to give him pleasure. There is joy in action for the sake of action. As he grows a little stronger, and begins to creep and roll about, he experiences a new pleasure from the exercise of the muscles, — the pleasure of handling objects and moving himself from place to place. When he begins to stand on his feet and balance himself in the erect position, and then to walk and meet obstacles, and overcome resistance, a new pleasure accompanies every new effort. This is true of the development of every new form of movement, and the exercise of every kind of power, such as running, throwing, catching, etc., in which children

show so much delight. The aimless and almost incessant movements of the child are his ways of taking exercise. Nature prompts him to make these varied movements of head, trunk, and limbs, and a healthy child can hardly resist doing so.

It is nature's first efforts toward free muscular development, and they should not be thwarted or opposed. On the other hand, we should do everything we can to favour and encourage these spontaneous movements of the child. See that the limbs have free play, and that no bodily movement is hindered by tight clothing. Long frocks or petticoats should never be worn by children. They impede the action of the lower limbs, and often cause defects and mannerisms in the gait that last through life. A suit made on the plan of a union garment, or little overalls and suspenders, are much better for a knockabout suit for either sex to play in. In children, the legs do not develop as soon as the arms, and care should be taken not to overwork the lower limbs, for fear of causing bow-legs or knock-knees. Children can stand a great deal of activity if they have a frequent change in the variety of exercise, and frequent intervals of rest. The practice of taking children off on long walks, which some parents indulge in, is pernicious. Children's legs are much shorter than adults, and in order to keep pace with them, they have to take very long steps or quicken their gait into a run. This effort not only causes great muscular fatigue, but sometimes is

the origin of a heart strain, which may incapacitate the child for any further efforts.

Up to ten years of age, a child's bones are very plastic, and they are susceptible of being moulded into almost any shape. For this reason, parents should frequently see their children naked, or have them examined by an expert, in order to discover whether they are growing and developing properly in trunk and limbs.

Great care should be taken to see that the stockings are not suspended by straps from the shoulder-girdle, as this practice tends to droop the shoulders and curve the spine. Care, also, should be taken to see that the school seat and desk are not too high or too low, but perfectly adjusted to the knee-height and sitting height of the child. If the seat is too high, the child's thighs will be bent forward, and the circulation of the blood in the legs and feet will be impeded. If the desk is too low the child will become round-shouldered; if the desk is too high, one shoulder will grow higher than the other, or the spine will be curved and twisted.

For the same reasons, great care should be taken in the selection of rocking-horses, ponies, bicycles, carts, sleds, skates, shoes, and even lounges and beds.

Everything a child makes use of he tries to adapt himself to. Therefore, if saddles for riding-horses, ponies, or bicycles are too broad, or if stirrups, handle-bars, etc., are not properly adjusted, or if beds are too soft, pillows too high, shoes too short or too long, with soles too thick, etc.,

we have some of the factors at work which are moulding, silently but surely, the bow-legs, knock-knees, drooping heads, rounded shoulders, flat chests, crooked spines, flat feet, and defective walk and carriage, with which those of us who examine children and adults are far too familiar. Habitual postures, like habitual actions, make us what we are in form and figure. In fact, all postures are the results of sustained muscular action, in which some groups of muscles are kept continually on the stretch, and other groups in a state of mild contraction.

If you wish to know what this means, take a seat in the front row of a gallery, or in some place where the seats are placed so near together that it is impossible for you to straighten your legs. How the knees will ache, and also muscles on the front of the thighs that have been kept so long on the stretch. A change of position that will enable you to straighten your legs for a minute will bring you almost immediate relief.

This is only a single illustration. Every posture long sustained causes aching muscles, and a change of position is the only way of getting relief. Remember that it is often harder for an adult to sit still than it is to move about. When a child shifts his sitting position, stretches his arms or legs, and leans and lolls about on his desk, he is often seeking rest for muscles that have been kept too long under tension. If the seat is made too comfortable, or the stooping or leaning position is too long and repeatedly maintained, the overstretched muscles lose

their tonicity and an ill formation or permanent defect soon becomes established. The only relief is frequent change of position, and the practice of developing movements and corrective exercises.

I have dwelt at some length upon the plastic condition of children, because it renders them so susceptible of injury as well as improvement. Nothing is more likely to injure them physically than frequent and persistent confinement to school seats and benches. Nothing is more likely to improve them than frequent change of position, and the widest range of movement.

Up to ten years of age, an active child usually finds his best exercise in such plays and games as, "London Bridge is Falling Down," "Ring Around a Rosy," "King, King, Calico," "Prisoners' Base," "One Old Cat," and the various forms of "tag." But it is an error to suppose that all children will play even when an opportunity is offered them. Many children seem to be born without the playing impulse. If left alone with other children, they are crowded out of the game, and seem to be contented in seeing other boys play. Such children often need to be incited to make efforts for themselves. Some one always has to take the initiative for them.

Children are very fond of imitating the efforts of older persons, and at a very early age they aspire to be men, and introduce into their childish plays and games many of the forms of activity that chiefly concern men. Children are also very fond of imitating different animals

and various kinds of machines. By taking advantage of this keen faculty for imitating the employments of their elders, the interested parent or teacher may often induce children to follow her through a very valuable series of exercises for strengthening, developing and corrective purposes.

Some of these exercises are described in the text and illustrations under the names "Wood Chopping," "Scooping Sand," "Diving," "Steamboat," "Teamsters' Warming," "Locomotive," "Chicken Wings," "Hand Fire-Engine" "Jumping Jack," "Charge Bayonets," "Throwing Ball," "Hurrah," and the like.

These exercises are especially designed to bring into action the large surface muscles of the trunk and limbs rather than the smaller and finer muscles of the hands, arms, and feet, which, for the benefit of the child's nervous system, may better be developed later.

If the parent or teacher will lead up to these valuable exercises through some sort of dialogue or story that will appeal to the imagination and suggest plenty of action, such as going on a journey or a picnic, where different experiences occur as a matter of course, he will find the interest of the child greatly intensified. Not only will the child enter into the exercises with the keenest enjoyment, but the exercises themselves will prove much more beneficial.

In giving exercises to children, remember that the one thing they cannot stand is continuous tension and mo-

notony. This is what makes walking, standing, and all attitudinizing and slow-moving exercises so wearisome to children. Give them short, quick, lively exercises, with frequent changes and plenty of rest.

It matters not how interesting or amusing the exercise, game, or play is, the child soon wants to "play something else." The following list, which may be best given in the order enumerated, are very good exercises for children, both from the standpoint of interest and development.

EXERCISES FOR CHILDREN

1. Adoration.
2. Scooping Sand.
3. Steamboat.
4. Chicken's Wings.
5. Hand Fire-Engine.
6. Teamsters' Warming.
7. Signal Station.
8. Locomotive.
9. Clap under Legs.
10. Standing Start.
11. Striking the Anvil.
12. Jumping-Jack.
13. Rowing.
14. Dog Trot.
15. Restoration.

CHAPTER VII.

EXERCISES FOR BOYHOOD AND YOUTH

AFTER a boy arrives at the age of ten or twelve years, he will begin to forsake what he terms childish plays and take to something more serious. The exercises that are most likely to claim his attention are running, jumping, boxing, swimming, skating, the popular games, such as baseball, football, hockey, and various forms of heavy gymnastics.

He wants to do something to assert his individuality. He feels that he is becoming a man, and desires to show his skill, strength, and courage in doing manly things. He delights in the approval of his mates, and likes to excel in the feats and "stunts" that demand their admiration. In becoming the fastest runner or the highest jumper in his neighbourhood, he is lifted out of the crowd and singled out for distinction.

This recognition often makes him ambitious to prove his abilities in other sports. He feels the growing instinct for companionship, and, having won distinction for himself, he wants to join a club or team where he can show his prowess in winning distinction for others. He

wants an opportunity to "play his part," "hold up his end," "pull his oar," or "maintain a position," that will prove the value of his services to the club or community of which he is a member.

It is expected that every healthy boy will learn to run, jump, row, swim, skate, box, fence, and wrestle as a means of self-culture and individual accomplishment. It is very difficult for a boy who cannot do these things to get any line upon his own abilities, or get any rating among his mates.

As I have stated in a previous chapter, it was only by indulging in such all-round exercises that the race has been enabled to maintain its existence. Our youth take to them instinctively as a matter of course.

But it is very seldom at the present day that one's life depends upon the speed with which he can run, or the distance he can jump, though his ability to swim might be the means of self-preservation.

It is a question, therefore, how far boys should be encouraged to attain a high degree of excellence in these various sports. Even now no thoroughly self-respecting boy would care to use his abilities as an athlete to further his own selfish ends. It is only as a member of some school, college, or city athletic club, where self interests are subordinated to the welfare of the common cause, that the youth of to-day can be induced to put forth their best efforts.

This is the spirit that is back of some of our best institutions and furnishes us with our highest ideals of community life. Add to this desire to work for the interest of one's club, society, school, or college, the pleasure and exhilaration that comes from the pursuit of the game itself, and you get at the basis for the boy's enthusiasm over baseball, football, basket-ball, and other athletic contests.

The ability to do good team work, the readiness to throw oneself into the breach to stop an assault, the willingness to make a sacrifice hit to advance one's side, to jump overboard in order to lighten the boat when one's oar is broken, are types of modern heroism that make great impressions upon our youth.

They are always living in an age of chivalry, when the bravest man is not the man who only goes as far as others dare to go, but the man who dares to go farther, and does go. Courage, loyalty, and self-sacrifice are the qualities born of this age, and who shall say that they are not qualities worthy of the highest degree of cultivation? As long as there are new problems to be solved, new enterprises to be launched, new regions to be explored, where men must act in combination whether in the pursuit of war or of peace, these qualities will always be in demand. The age of youth is the time to foster and cultivate the heroic virtues, and there is no better way of doing it than by the *judicious* practice of manly sports and games.

When we come to a practical application of these theories, however, we find it very difficult to realize the many advantages claimed for athletic sports. The large amount of land required for the practice of the popular games, and the small amount that is available in large towns and cities, where out-of-door activity is most needed, places at once a limit on the number of our youth who can engage in these invigorating exercises. Then again, the high standard of skill and ability demanded of those who participate in the sports and games, necessarily restricts the number who can take part in them: firstly, by discouraging a great many boys from trying to qualify for the athletic teams, which they find they cannot do without giving more time to practice than they can afford, and secondly by eliminating a great many by process of trial who are physically unfit to stand the strain of the contests.

Thus our present-day athletics bring to the front a small minority who are naturally strong and vigorous and do not need so much physical training, and shut out the great majority of the boys who are not so well endowed physically and who do need just this kind of training to prepare them for their life's work.

A few of the larger schools and colleges try to meet this tendency, by encouraging the formation of class competition, by having first, second, third, and fourth teams in the more popular games, and by trying to awaken interest in those less popular, such as lacrosse, cricket, ice

and field hockey, basket-ball, hand-ball, tennis, and many others, which from a physiological point of view are superior to some that are now receiving much more popular attention.

This is a step in the right direction.

Some other evils have grown up in connection with the practice of athletic sports which threaten to lessen their value both physically and morally as a training for boys. One of these evils is the desire to win at any cost, which seems to have taken possession of our youth within the past few years.

Victory as an end in the minds of many boys would seem to justify the employment of almost any means to attain it. This has led to the practice of various tricks and deceits to deceive the umpires or disconcert the opposing players; also to the wilful violation of the regulations governing amateur sport, and the registration of players who are not officially connected with the school or college to which they are credited.

In some of the large colleges where the competitive spirit runs high, and the rivalry in athletics is intense, all sorts of inducements are offered to schoolboy athletes to enter these institutions. Once entered they are supposed to work their utmost for the success of the "nine," or the "eleven," and for fear they will not do their best, the non-athletic students are urged to visit the training-grounds and encourage the players with their cheers and shouts. In order to keep up this highly artificial strain

and stress in athletics, the pleas of "developing manly courage," "fostering loyalty to the institution" and "cultivating the spirit of self-sacrifice," etc., have been in my opinion sadly overworked.

Young athletes are often induced to endure the hardships of almost continuous training on the ground that they are working for the honour of the school or college with which they are connected, whereas they generally represent no one but themselves and their coachers and trainers. Athletic contests provide amusement for the many, but physical culture for the few. Yet it is in the hope of getting some physical improvement for their sons that many parents send them to athletic schools and colleges. Surely there is a difference between the physical training that one gets in seeing a thing done, and trying to do it oneself.

For those who are left out in the competition for places on the school and college athletic teams, and for those who are really in earnest in their desire for physical improvement, I offer a series of developing exercises without apparatus, which may be termed Home Athletics.

These exercises may be practised at any time and in any place. They are not only designed to give one a fine all-round development, but to attain that form in practice which it is necessary for one to have who wishes to excel in the several athletic events. The list includes such exercises as putting the shot, throwing the hammer, etc., and may best be practised in the order given.

HEALTH, STRENGTH, AND POWER

EXERCISES FOR BOYHOOD AND YOUTH

1. Adoration.
2. The Boxer's Guard.
3. Putting the Shot.
4. Rope Pulling.
5. Swimming (Breast Stroke).
6. Jumping-Jack.
7. Swimming on Back.
8. Hoisting Sail.
9. Fencing.
10. Hand Fire-Engine.
11. Throwing the Javelin.
12. Dog Trot.
13. Charge Bayonets.
14. American Eagle.
15. Lower Chest.
16. Locomotive.
17. Throwing the Discus.
18. Steamboat.
19. The Long Pass.
20. Signal Station.
21. Diving.
22. Measuring Tape.
23. Rowing.
24. Driving Stakes.
25. Standing Start.
26. Hurrah.
27. Crouching Start.
28. Restoration.

CHAPTER VIII.

EXERCISES FOR YOUNG MEN

AFTER graduating from school or college, young men miss the opportunities and incentives for physical training that stimulated them to effort during their youthful days. They have entered upon the study or practice of a profession, or engaged in some occupation where the demands of business are very exacting and the chances for physical improvement are rare indeed. It is true that many of the varied occupations in which young men engage do afford great opportunity for physical activity, but in consequence of the division of labour which we have spoken of elsewhere, this physical activity is likely to be very limited and leaves a man in need of exercise of a different kind to keep him in good physical condition. This is especially the case in the large cities, where good light and air are at a premium, and where confinement to an office or store becomes all the more irksome.

If the young man has been accustomed to some athletic training while at school or college, he will feel the need of it very much when he first goes into business or settles

down to office work. This new experience will be especially trying if he keeps up his training diet.

Many a college man has had to admit to his discredit that he could not stand the strain of close confinement in professional and business pursuits as well as could the office clerks who had had no such opportunities as the college men for the attainment of mental and physical vigour. Those who have acquired strong and vigorous hearts, lungs, and muscles, through the practice of vigorous athletic exercises, through the growing period of their lives, cannot drop these exercises with impunity upon arriving at adult age. Organs and tissues that have been built up in response to the demands that have been made upon them for years by an energetic life cannot be suddenly adapted to the requirements of a sedentary life. Strong hearts, capacious lungs, and vigorous muscles must necessarily have a continuance of some of the work that contributed to their development, in order to keep them in a healthy condition.

When the young man in the city or country looks around for an opportunity to practise his college athletics, he meets with difficulties. He may join an athletic club of some kind, but he will find very few athletic clubs that have baseball nines, football teams, or facilities for crew rowing. All active interest in these popular sports is likely to end with school and college days, because it is impossible to find the young men who can afford to give the time necessary for practice. Without practice a high

standard of excellence cannot be attained, and unless athletic teams can make a creditable showing they receive neither popular favour nor financial support.

Then again, the sentiment which keeps boys up to their athletic work while at school and college is lacking in the city athletic clubs. Add to this lack of incentive the loss of time in getting to and from the place for practice, and the large expense for membership, and we see some of the reasons why the majority of young men, after leaving school, cannot keep up their practice in football, baseball and track athletics.

As a consequence, a large portion of the membership in most of the city athletic clubs is composed of men of athletic taste who join the clubs principally for social or business purposes, and incidentally pay their fees to see some other man, a non-member probably, perform for their amusement.

This tendency is radically wrong and shows how far we have gone adrift in this whole athletic movement. The Young Men's Christian Association gymnasiums, through their well-trained directors, are trying to overcome this evil tendency by confining their attention to such exercises and games as the average man can participate in, leaving the enthusiastic devotee of a single specialty to look after himself.

Then there are a large number of small clubs for riding, fencing, boxing, rowing, bowling, canoeing, golf, tennis, etc., where sport is pursued for sport's sake, and the members

actually participate in the sports to which they subscribe. A large part of the pleasure which one receives from following some specialty comes from meeting those who are equally interested and skilled in the same sport.

A person naturally does not enjoy participating in a game which he cannot play or in a sport in which he is not fairly skilful.

This implies practice in early youth, for it is exceedingly difficult for a man to become skilful in a sport or game which he takes up after twenty-five or thirty years of age.

For this reason the sports of one's later youth should be made to embrace not only the large developmental games such as baseball, football, lacrosse, rowing, etc., but the sports requiring some individual skill and alertness, such as fencing, boxing, wrestling, skating, swimming, handball, tennis, dancing, etc. They call for much less space and fewer opponents or playing partners than the larger games, and it is easier to find opportunities to practise them. So important do I regard these accomplishments in individual athletics apart from team contests, that I would have every boy taught one or more of them before he is twenty-one years of age.

Instead of putting so much stress upon what promising and vigorous boys are likely to do for school and college athletics, more attention should be given to what athletics are likely to do for the average school and college boy.

Success in life depends largely upon energy, strength,

courage, alertness, persistency, stamina, and endurance, and it is the province of athletics to cultivate and maintain these manly virtues.

If a young man comes to the threshold of his business or professional career without these qualities, he should lose no time in trying to acquire them, or if he has them, in trying to keep them in active service.

If the opportunity offers, join a gymnasium, or some of the numerous clubs I have mentioned, for the practice of physical sports and recreation. Avail yourself of every chance to walk to or from your business, if not more than a mile or two in distance. Occasionally break into a run, stopping just short of the perspiring stage. Don't take an elevator if you only have one or two flights of stairs to climb. Skate, swim, hunt, fish, row, and dance as the opportunities present themselves. Don't despair of attaining physical vigour, even if all of these different avenues of sport are closed to you. Remember you always have home athletics, and physical exercises that you may take in your room, to fall back upon. I have seen some excellent results obtained by the practice of these simple exercises. They require a little courage at first, but if you keep at them persistently until the habit is established, good will surely follow, as a matter of course, and you will begin to feel stronger and better from the start.

One advantage these exercises possess over many others is that they may be taken in the morning or evening, as

you are dressing or undressing, so that no change of clothing is necessary. As a general rule, unless the temperature of the room is below 50°, the less clothing one has on during exercise, the better.

Try to get into a perspiring state, or at least a warm glow, before finishing your exercises, take a cold sponge bath immediately afterward, and rub down with a rough Turkish towel. The following is a list of excellent exercises for young men, which will be followed by the best results if taken in the order given.

EXERCISES FOR YOUNG MEN

1. Adoration.
2. Putting the Shot.
3. Chopping Wood.
4. Standing Start
5. Steamboat.
6. Boxing.
7. Sawing Wood.
8. Throwing the Hammer.
9. American Eagle.
10. Hurrah.
11. Clap under Legs.
12. The Long Pass.
13. Crouching Start.
14. The Windmill.
15. Grand Bend.
16. The Signal Station.
17. Hoisting Sail.
18. Throwing the Discus.
19. Rowing.
20. Swimming on the Back.
21. Mowing.
22. Furling Sail.
23. Fighting Gladiator.
24. Lower Chest.
25. Jumping-Jack.
26. Restoration.

CHAPTER IX.

APPROPRIATE EXERCISE FOR GIRLS

Up to ten or twelve years of age, there would seem to be no good physiological reason why girls should not indulge in the same physical exercises as boys of the same age. They have the same bones, muscles, and nerves, the same hearts, lungs, stomachs, and brains, as boys, and these important parts and organs in both sexes need the same care and attention in order to enable them to properly perform their several functions.

Moreover, inasmuch as girls are more hampered and restrained by their clothing and social customs, after twelve years of age, than boys, it is all the more important that they have greater freedom of movement during their early youth. Many a woman owes the health and vigour of her matured life to the fact that she was allowed to run, jump, skate, swim, and play all manner of out-of-door games with her brothers.

Although girls are born a little smaller than boys, they soon overtake them in height and weight, and at the age of twelve are actually larger upon the average than boys of that age. If the girl has had a fair chance,

she can often surpass the boys of her age in physical efficiency, as shown by her ability in running, swimming, bicycling, and general gymnastics. This physical superiority over the boy, however, only lasts for a few years; then he forges ahead of her, and by the age of twenty, the man, upon the average, is five inches taller, weighs twenty pounds more, and is fully two times stronger than the average woman of the same age. The superior height, weight, and strength of the girl of twelve are an indication of the importance which nature places upon these qualities as a preparation for the duties and responsibilities of the woman's life. At this time the woman must have perfected within her organism the vital machinery for supporting two lives instead of one, and this fact must ever afterward be borne in mind. As strong, therefore, as I am in advocating a similarity of exercises and opportunities for physical training for both boys and girls up to the age of puberty, I am equally strong in the opinion that the girl's physical training should be very different from the boy's after this period. Not but that girls should be permitted and encouraged to still engage in many of the exercises usually monopolized by boys; but they must all be entered into with certain mental and physical reservations. A failure to regard this important consideration often brings ill-health to girls and bad repute to gymnastics and athletics. We have, then, on the part of girls, an anatomical structure which requires just as much care

and attention to keep it in good working order, an emotional nature which renders her more likely to carry the exercises she enjoys to excess, and a functional demand upon her organism that renders it necessary to keep a large stock of her power in reserve.

The exercises which are the best calculated to build up the muscular system of a boy or girl are those of a well-appointed gymnasium. This is what those institutions are primarily for, and they are of the greatest importance to women and children, for several other reasons.

All of the exercises can be carefully adjusted, regulated, and controlled, so that they can readily be adapted to the strength of the strong, as well as the weakness of the weak. They can also be applied directly to strengthen local parts and tone up the condition of debilitated organs. They can be limited as to time and amount. They can be practised every day in the week and during all seasons of the year. They allow freedom of dress, and a certain amount of privacy, which cannot be secured on open playgrounds.

The most important exercises for girls are those that develop the muscles about the waist and abdomen, not alone because great muscular power in this region is required of women, but because of the effect which exercise of these parts has upon both stomachic and intestinal digestion. Strange enough, it is the waist and abdominal region that women have rendered most

inert through the conventional method of dressing. In order to fortify themselves against the evil consequences of this silly fashion of constricting the waist, waist and abdominal exercises in young girls should receive supreme attention. The best exercises for developing this region of the body are the Free Exercises, which I shall mention later, that may be practised in the gymnasium, or in one's room night and morning, when free from the restrictions of the ordinary clothing. Then rowing, a most admirable exercise for the development of the muscles of the abdomen, waist, and back, as well as those of the arms, and shoulders, and legs, if the sliding seat is used. Swimming is perhaps one of the best exercises for girls, because nearly all of the muscles of the body are brought into a state of gentle activity. The head is thrown back, the chest forward, and every stroke of the arms tends to increase the chest expansion. So many muscles, also, are brought into action that the lungs and heart are greatly stimulated, and all parts of the body share this increase of the respiration and circulation. Moreover, swimming is an exercise which all girls should practise as a precautionary measure in case of accident on the water, and it is one of the sports in which women may excel.

Dancing, of course, every girl should indulge in, not necessarily the society dancing that always requires a partner, but that free and joyous expression of the emotions through the rhythmic and graceful movements

of the body and limbs which delights both the performer and the observer. The self-possession and the mental and physical poise that comes from this kind of dancing, which is taught in most gymnasiums, is worth everything. Fencing is very much to be recommended on the same grounds. Then the Indian clubs, which give so much grace and finish to the movements of the hands and arms, are such valuable agents for training one's powers of coördination.

Juggling with the bounding balls, which so delighted the maidens of Ancient Greece, and to which the Japanese attribute so much of their manual dexterity, is an admirable exercise for training both eye and hand to accuracy and alertness.

Wands, dumb-bells, and chest-weights, those indispensable agents of the well-equipped gymnasium, are always serviceable and accessible for developmental purposes, and so are the swings, ladders, ropes, bars, and much of the so-called heavy apparatus. Learning how to climb a ladder, descend a rope, or swing from a bar are simply lessons in the art of handling the weight of one's body by the arms, which every healthy girl and boy should be able to do. Every girl should learn to ride a bicycle, and where the opportunity presents itself, she should learn to ride horseback also.

Physical accomplishments bring their mental as well as physical equivalents, and should be considered part of the girl's mental education.

There are many active games and plays in which girls may engage with profit, but those which are most likely to enlist their interest and attention are cricket, baseball, basket-ball, field-hockey, hand-ball, squash, and lawn-tennis.

In the playing of the highly competitive games lies an element of danger which it is well to recognize and resist.

We have seen in the previous exercises that we have recommended that the amount of effort called for could be carefully regulated by the teacher, through the movements selected, the resistance to be overcome, time required, etc., so as to meet the needs of the individual.

When one is exercising by herself, she can start or stop when she desires, and the effort she puts forth is entirely dependent upon her own initiative. It is not so with exciting games. Here you have the efforts of an opponent to meet, or you have a position to maintain, where failure to play your part may cause the defeat of the whole team. You feel that you have the reputation of your family, school, society, or class at stake. Urged on by admiring friends and companions, you not only strive to do your best, but better than your best. You would not be worthy to represent your team or school if you did not put forth your best efforts to bring victory to their shrine.

It is in this energetic unselfishness, in this persistent and courageous effort to work for the good of the cause,

and to patiently strive for success, that others may enjoy it as well as yourself, that makes athletic games so attractive to high-spirited boys and girls. They teach a grand moral lesson that all should learn.

There is nothing in the nature of the games I have described that any healthy girl cannot participate in, and enjoy, if played with moderation. Nor is there anything injurious in the nature of running, jumping, hurdling, or swimming in competition, provided the training and the efforts put forth are kept within reasonable limits.

Here is one of the difficulties. It is the spirit of emulation, team work, etc., that makes athletic games and competitive sports so interesting and exciting, and it is the same spirit of emulation and rivalry that makes them so likely to be carried to excess. Given two individuals, teams or schools, determined to win at any sacrifice, and we have all of the conditions necessary for the employment of male coaches and trainers, and the overzealousness, the overstriving, and overstraining that has injured some of the contestants and brought the playing of antagonistic games, like basket-ball and hockey, by girls, into ill repute.

Now, the principal objection to athletic contests for girls arises from the failure of some educators and physical instructors to recognize the essential differences between the sexes after the age of puberty. As I have stated in the beginning of this chapter, before this age boys and girls can engage in the same physical exercises with

impunity; after this age the exercises must be modified so as to meet the organic necessities of the woman.

To insist upon girls playing violent athletic games under the same rules and regulations that govern the contests of boys, and to put them through the same vigorous method of training, is not only cruel to the girl, but it is suicidal to the race.

Such physical training and such athletic contests would probably bring to the front the type of girl that could stand it, but it would not be a type that would be noted for its feminine graces either in figure, manners, or accomplishments. Some of the changes that would be brought about by such a system of training I will treat of under the chapter on exercises for women.

The free developing exercises best adapted to the use of girls are as follows:

EXERCISES FOR GIRLS

1. Adoration.
2. Tree Swaying.
3. Scooping Sand.
4. Paddling Canoe.
5. Hoisting Sail.
6. Swimming (Breast Stroke).
7. Striking the Anvil.
8. Chicken Wings.
9. Horizontal Balance.
10. Archery.
11. Clap under Legs.
12. Courtesy.
13. Diving.
14. Windmill.
15. Fencing.
16. Grand Salam.
17. Throwing the Javelin.
18. Rowing.

19. Swimming on Back.
20. Signal Station.
21. Grand Bend.
22. Furling Sail.
23. Measuring Tape.
24. Lower Chest.
25. Rocking the Boat.
26. Locomotive.
27. Restoration.

CHAPTER X.

EXERCISE FOR WOMEN

WITH women, as with men, it is very desirable to learn exercises in their youth to practise when older.

Exercises and games which require some skill and adroitness, like dancing, fencing, lawn-tennis, and many others, come slowly to those who are well advanced in adult life, and for this reason many persons who are in need of physical recreation are loath to take them up. They do not like to bring their awkwardness into unpleasant comparison with the nimbleness and gracefulness of youth, and so frequently forego the pleasure of practising in skilled sports altogether. At the same time, women are more in need of some kind of physical exercise to-day than at any time during their recent history. The confinements of school life; the restrictions and limitations of shop, store, office, and factory work, the perplexing cares and responsibilities of bringing up a family; the idle and luxurious habits of the newly rich; together with the hampering and constraining influence of clothing, with which all classes are more or less

oppressed, impose conditions upon our women which are detrimental to their health and vigour, and which must be met as far as possible by more sanatory methods of living.

The hours spent in the schoolroom, added to the hours required for study at home, interfere very much with natural growth and development, and unless something is done to provide for more physical activity than is required in following out the ordinary school curriculum, the average girl reaches maturity in a more or less enfeebled condition. She has built a brain, but in many cases it has been at the expense of her body, and muscular weakness, malnutrition, pallor from want of good red blood, hysteria, and other nervous troubles, are quite in evidence. The rapidity with which women recover their normal condition when they take systematic exercise, is an indication of what they should have as a constant factor in their every-day lives, — less brain worry, and more physical activity.

The economic conditions which make it necessary for many women and girls to earn their living and contribute to the support of a family, are bringing about sad physical results in many instances. Division of labour, which has so restricted the physical activity of men, is equally baneful in its influence upon the health and physique of women. Women, being regarded as the weaker sex, are generally given or fit into positions which require seemingly little physical effort, such as clerks, stenographers, typewriters, cashiers, bookkeepers, saleswomen, waitresses,

factory employees, etc. But, as a matter of fact, the confined positions in sitting or standing, the constant use of small groups of muscles, and the continued nervous tension under which many women have to work, are much more fatiguing than the employment of larger groups of muscles in more strenuous efforts with frequent intervals of rest. Many a college football player would "go stale" under the peculiar muscular and nervous strain which hundreds of women are going through daily.

What this class of women most need is something that will give them a broader range of physical activity and relief from nervous tension. Something that combines the elements of rollicking fun and innocent amusement with helpful, corrective exercises. A well-equipped gymnasium that has something to meet the needs of all classes, best meets the peculiar needs of the working girls, — a gymnasium with a pleasing, competent instructor, inspiring music, and agreeable comrades; where corsets may be laid aside for an exercising suit, and freedom to breathe and to move be thoroughly enjoyed.

It is gratifying to know that many of the great manufacturing establishments, like the Plant Shoe Factory, in Roxbury, Mass., the National Cash Registry, at Dayton, Ohio, the Ludlow Company, at Holyoke, Mass., and many others, are providing well-furnished gymnasiums, with instructors, baths, resting-rooms, restaurants, etc., for their employees. It is also gratifying to learn that improved service, and the time saved through the reduc-

tion in the amount of sickness on the part of the employees, more than compensates the employers for all the money expended in behalf of physical recreation.

Where girls are attending school, or earning their living in offices, stores, or factories, they have little time or inclination for housework, and the burden of keeping the family together, and attending to the household duties, usually devolves upon the mother. Under such circumstances, she is rarely in need of physical exercise, though she is often in need of physical recreation.

But of late years, the cares, responsibility, and expense of housekeeping have induced many families to board or to live in apartments, where the physical efforts required to keep one's home or rooms in order have been greatly reduced. Where families are so situated, the women of the household frequently do not have enough muscular work to do to keep them in good condition. If this freedom from the necessity of making strenuous physical efforts is accompanied by overeating, and luxurious habits of living, then obesity and ill-health speedily follow.

This is one of the evils that always accompany too much prosperity, and prompts the poet to sing:

> "Ill fares the land, to hastening ills a prey,
> Where wealth accumulates, and men decay."

I have dwelt at some length upon the importance of physical activity for women, not because it will ever be desirable for them to compete with men in work requiring

great muscular strength, but because it is a matter of organic necessity.

Two-thirds of the body weight consists of bones and muscles, and these parts can only be kept in condition by performing the functions for which they were created. In performing these functions, they not only improve the quality and tone of bones and muscles, but they improve the health and strength of the entire system, including brain, nerves, heart, lungs, and pelvic organs, through the effect produced upon the respiration, circulation, digestion, etc.

The possession of large muscle areas into which the blood may be drained at times, to relieve blood-pressure in the brain or pelvis, is a matter of the greatest importance, and often constitutes the difference between a life of enjoyment and one of periodic misery.

Now the way to acquire these large muscle areas is not by engaging in feats of strength, or in entering upon the practice of antagonistic games and competitive athletics, — but by engaging in exercises that require greater continuity of effort and a less expenditure of nervous energy. Some of the exercises that are well calculated to produce the desired effects I will illustrate at the close of this chapter.

Exercises which require a considerable number of conscious contractions of the muscles, made rhythmically, and followed by more or less complete relaxation, seem to contribute most to their general nutrition. Many women

are often deterred from making conscious muscular efforts through fear of acquiring "large knotty muscles." There need be little fear of this, as all the muscle that most women are likely to attain is pretty sure to be covered with more or less adipose tissue.

Some of the recreative exercises in which women may indulge with profit from maturity on through middle life are walking, bicycling, rowing, swimming, golf, and gentle running. Walking in a short skirt, with good walking shoes, across country, up hill and down, is an admirable exercise for the development of the lower extremities, and for improving to some extent the respiration and circulation.

Bicycling, which I am glad to see coming into fashion again, is especially valuable for heavy women. While walking they have to support their own weight, and have acquired muscular power in so doing. In bicycling the machine supports the weight of the body, and the well developed muscles of the lower extremities are left free to do the pedaling. Under such circumstances the heavy person is induced to ride farther, and get out into the country, where blooming trees, green fields, and a thorough change of air and scene bring good cheer and refreshment.

The bicycle is a better all-round leg developer than walking, and the handle-bars, if used properly, may be made to aid the respiration.

Rowing and swimming are as valuable to women as to girls, but they should be practised in moderation, because

of the large number of muscles involved and the consequent strain put upon the heart and blood-vessels.

Golf is especially advantageous to woman, not only because it takes her out into the open country, but because the game calls into particular action the muscles of the chest and front and side walls of the waist and abdomen. If the waist is large and fleshy, this game tends to reduce it; if, on the other hand, the waist is narrow and constricted, golf tends to broaden it. It is a splendid antidote to the corset, as it tends to develop the abdominal muscles which this garment makes inert. For this reason golf is a better game physically for women than for men, as these muscles are more important vitally to the former than to the latter. As Mosso, the distinguished physiologist, says, "In their lives women have terrible moments when weakness in the contraction of these muscles prolongs the labour of a mother and sometimes causes her death." These are the muscles upon which the Greeks laid so much stress in their male and female statues, and for the development of which they prescribed so many exercises.

All exercises should be considered especially advantageous for women in proportion as they give employment to the respiratory muscles of the chest, the muscles of the spine, and the muscles of the waist and abdomen.

Of course there are many mental, moral, and social advantages in athletic games, but I am intentionally narrowing myself down to a consideration of their physical advantages, which, after all, is what they are practised

for. I maintain that women cannot compete successfully in men's games, under men's rules, without acquiring traits and physical characteristics which are essentially masculine, any more than men can engage in woman's work without becoming more or less effeminate. The term, manly sports, implies that they are sports which tend to make men more manly, not women more womanly, and yet the latter's feminine characteristics are just as essential to the welfare of the race as the former's manly qualities.

In the early history of mankind women and men led lives more nearly alike, and consequently they were more alike both mentally and physically than they are to-day.

As an illustration, compare the Indian women and men with those of our white people. The former look alike, the latter look unlike. This divergence of the sexes is a marked characteristic of progression among highly civilized races.

Woman's instincts teach her that her power and influence in the world depend upon making herself different from man. For this reason, and in order to accentuate her sex, she has encumbered herself with skirts and constricted herself with corsets for some three thousand years. Although these artificial restraints have hampered woman physically and organically, they have at least helped to preserve her identity. Long hair, smooth skin, broad hips, slender waist, sloping shoulders, large thighs, well developed mammæ, and small wrists, ankles, hands,

and feet will continue to be regarded as feminine characteristics, and the vast majority of women will adhere to these ideals long after the brawny athletic girls and the manly women have had their day.

While rejoicing, therefore, in the emancipation of woman from anything that interferes with the full development of her body, limbs, and vital organism, let us be sure that we do not recommend for her adoption as an aid to this development exercises that, when pushed to extremes, tend to unsex her. I refer to the highly competitive games and athletic contests now being introduced into many of the schools and colleges for women.

In order to keep these exciting games and contests within the bounds of safety, a careful system of training should be taken in preparation, and the rules so modified that the time of playing, distance run, height jumped, and weights thrown, etc., shall only be about one-half that expected of men.

To many who read this book it may seem absurd that I have thought it necessary to caution any class of women against carrying athletics to excess, realizing that many more women need to be stimulated in their efforts to take exercise, rather than to be repressed. This is very true, yet from my official position I have been appealed to so frequently for my opinion as to the advisability of women participating in athletics that I have taken this occasion to give expression to my views on the subject.

Probably the great majority of women have little oppor-

tunity or inclination to practise many of the sports and games I have enumerated. I know, however, that very many of these women are sadly in need of the life and health-giving influence of some kind of physical exercise. To these women, and to all others who enjoy the pleasures of right living and well being, I recommend the following list of free movements and rhythmic exercises.

EXERCISES FOR WOMEN

1. Adoration.
2. Courtesy.
3. Throwing the Javelin.
4. Hoisting Sail.
5. Striking the Anvil.
6. Clap under Legs.
7. Mercury Poise.
8. Furling Sail.
9. Overhead Bowling.
10. Fencing.
11. Tree Swaying.
12. Mowing.
13. Pitching Hay.
14. Bowling.
15. Measuring Tape.
16. Pulling Rope.
17. Signal Station.
18. Paddling Canoe.
19. Swimming on Back.
20. Windmill.
21. Archery Movement.
22. Rowing.
23. Chicken Wings.
24. Hurrah.

CHAPTER XI.

THE BEST FORM OF EXERCISE FOR MIDDLE-AGED MEN

At the age of thirty or thirty-five most men are well established in their business or profession. The cares and responsibilities of life are beginning to demand more time and attention, and it becomes more and more difficult to break away from the desk, counter, or bench for regular exercise or systematic physical recreation. Moreover, if the exercise requires companionship and the coöperation of skilled players, as baseball, football, lacrosse, and some of the other games, it becomes difficult for all to arrange their engagements so as to meet at the club or grounds at a given hour. The field is preoccupied by younger and more active players, and you are forced to take your chances with them or to abandon this kind of sport for ever. This in brief is the history of the experience of many who have tried to carry the sports of their youth and early manhood into mature life.

Under natural conditions there is no reason why baseball, lacrosse, and cricket should not be practised up to the age of forty, and in some cases even longer. All the organs of the body are fully developed, all of the bones have con-

solidated, and the muscles are capable of standing the greatest strain and rendering the greatest service.

But we are constantly reminded that we are not living under natural conditions. We are playing the game of life under artificial rules and unnatural restrictions, which require us to shut ourselves up in shops, offices, and warehouses, and assume positions, habits, and customs which are detrimental to us individually, however the results of our efforts may serve to advance the condition of humanity as a whole.

We allow ourselves to become prematurely old, and to be burned out before our time, not because the real exigencies of life call for any such unnatural consumption, but because the spirit of the age and the high tension of present business methods seem to demand it.

Moreover, this individual activity is becoming more and more mental and less and less physical as time goes on. Steam-power and electricity are now bearing the heavy burdens of the world, and men are striving, through their mental efforts, to keep up with the increased volume of work that is poured in upon them, by the use of those swift and powerful agents.

But it requires a large consumption of fuel to generate steam and electricity; it also requires a large consumption of food to generate mental power and nerve-force. This food must not only be collected and prepared outside of the body, but it must also be properly digested, assimilated, and distributed within the body before its force-

value can be made available for mental or physical efforts.

These vital processes involve the action of heart, lungs, stomach, and other organs, which it is the province of certain kinds of physical exercise to develop and keep in a healthy condition. When it is considered that nine-tenths of all the food consumed is required to sustain the vital work of these important organs, and keep the internal machinery of the body heated up and ready for service, before any external work can be done, one begins to realize some of the responsibilities which devolve upon him in looking after his own organism.

Fortunate is he who brings to mature life well developed respiratory and circulatory organs and an efficient digestive apparatus. More fortunate still is the man who knows how to manage and care for these organs during the trying period of middle life.

The man who was athletic during his youth and early manhood feels well and strong, eats heartily, and sees no reason for changing his mode of living, though his occupation now is largely mental and he is confined to his office and desk eight or ten hours a day, taking little or no exercise. This is a fatal mistake. Very soon the digestion will be impaired and various forms of dyspepsia will begin to make their presence felt, such as constipation, distention of the stomach, flatulency, heartburn, acid eructations, and feelings of heaviness, dulness, and despondency.

The circulation will begin to grow more feeble, the hands and feet will be frequently cold, and passive congestions of the blood in the head, lungs, liver, or intestines will prove troublesome.

Sometimes attacks of vertigo will occur, or palpitation and irregularity of the heart. The lungs and throat will be troubled with an increased secretion of mucus.

Shortness of breath will ensue after the slightest effort, and this difficulty in respiration will lessen the amount of oxygen taken into the system. This will occasion an accumulation of by-products in the blood and tissues which ought to have been oxidized or burned up, and the clogging of the tissues with these products leads to gout, gravel, rheumatism, or the fatty degeneration of some of the most important organs and parts of the body.

To allow your system to get into this condition is like allowing your stove-grate to be clogged with ashes and clinkers, your funnels with soot, your water-pipes with rust, and your sink pipe with waste and dirt. Trouble and disease follow as a matter of course.

Men who have been accustomed to take vigorous exercise in their youth should do one of three things: engage in some active occupation, greatly reduce the amount of food they consume, or enter upon the regular practice of some form of exercise that will enable them to properly digest and assimilate it.

The best kind of exercises for men between thirty and forty to take, in order to keep the heart, lungs, stomach,

and brain in good condition, are mild forms of running rowing, swimming, horseback-riding, hand-ball, and lawn-tennis. After forty years of age and until over fifty, all of the above exercises may be continued in a mild degree if the individual has been long accustomed to them. But it would be inadvisable, if not dangerous, for a person over forty to start in upon the practice of most of these exercises.

Walking, hunting, shooting, fishing, bowling, golf, and bicycling would be more appropriate exercises for men as they approach fifty years of age. If one avoids hill-climbing in bicycling and walking, the above group of exercises may be practised in moderation up to sixty and over. The guiding principle for exercise after forty should be slow and easy efforts long continued, instead of violent or vigorous efforts at shorter intervals.

Where men have not been accustomed to take any kind of physical exercise during their youth, it is often a perplexing question to know just what to do in this direction after thirty or forty years have gone by. This is especially the case if the occupations in which they have engaged are mental or sedentary ones.

Where young men are too studiously inclined and devote all their attention to mental pursuits, the brain, of course, is the part that is most developed. The lion's share of the body's nutriment has been directed there to increase its growth and development, and all of the blood-vessels flowing to the brain are correspondingly enlarged

to meet the demands that have been made upon them. The rest of the body, including the heart, lungs, stomach, and muscles, have been made the slaves of the brain, and, having been deprived of their just share of blood, the body's food, they have not attained the power and efficiency of which they were capable.

But at the age of thirty the opportunity for building up and improving any organic structure has passed. The capacity of the vital organs have been gauged to meet the requirements of the brain, and after middle life they can rarely be made to exceed this function. Not unfrequently some one of these organs becomes weak and debilitated because it does not have enough work to do, and a diseased state soon follows. Weak lungs, a feeble heart, and a rebellious stomach, with flabby muscles and emaciated limbs are the usual accompaniments of a life of exclusive brain-work. Sometimes a person of this mental habit finds himself troubled with frequent headaches, confusion of thought and sleeplessness. He is advised by his physician to take up horseback riding or some other equally interesting and spirited exercise. He returns every time with more headache and feelings of exhaustion, and not infrequently forswears all kinds of exercise for ever after. In this case the trouble arises from taking exercises which are too stimulating to the heart. When the heart is made to beat faster than usual, the blood flows more rapidly throughout the body, but more especially into those parts where there are the

freest channels. In the constant head-worker the freest channels are always in the brain, and the blood frequently flows to this part in excess after vigorous exercise. Hence the cause of congestive headaches in such cases, and the condemnation of exercise as a means of relieving them. This case is a typical one.

If this man in his youth and early manhood had accustomed himself to take systematic physical exercise, thereby developing the large muscles of the trunk and limbs as they ought to be developed, they would, when used, act as reservoirs for the surplus blood that occasioned the throbbing head, and brought about almost instant relief. Congestion of the liver, bowels, and other parts of the body may frequently be relieved by those accustomed to exercise in the same way.

It behooves every man to develop his muscles during his youth, and to learn and practise some game or exercise which he may practise and enjoy as he grows older.

Where this has not been done, and the man, as he voyages through middle life, finds himself in need of physical vigour to sustain him in his daily work, let him remember that he must begin *slowly* and *cautiously* to acquire this desired result.

Don't begin by holding the limbs rigid and making the muscles hard and tense, for this process shuts the blood out of the muscles, and uses up too much nerve-force. You will get much better results by entering upon the practice of a series of slow, rhythmic movements, which

call for the action of the large muscles about the chest, back, and abdomen, and which are such a powerful aid to the internal organs in performing their functions.

The list of exercises given in this book which are best adapted to those in middle life are as follows:

EXERCISES FOR MIDDLE-AGED MEN

1. Adoration.
2. Courtesy.
3. Steamboat.
4. Archery.
5. Chopping Wood.
6. Fencing.
7. Signal Station.
8. The Long Pass.
9. Boxing.
10. Pitching Hay.
11. Windmill.
12. Chicken Wings.
13. Mowing.
14. Sawing Wood.
15. The Long Drive.
16. Rope Pulling.
17. Mercury Poise.
18. Clap under Legs.
19. Driving Stakes.
20. Bowling.
21. Hurrah.
22. Measuring Tape.
23. Grinding Corn.
24. Overhead Bowling.
25. Hoisting Sail.
26. Furling Sail.
27. Restoration.

CHAPTER XII.

EXERCISE IN OLD AGE

Among animals and in the primitive conditions of human beings, no efforts are made to prolong the lives of those who are approaching old age. As soon as an animal is unable to maintain a footing in the world, to fight his enemies, and gain food and shelter for himself, he is quickly exterminated.

Among savage tribes, where food is scarce, and the struggles for existence depend almost entirely upon physical strength and hardihood, the aged are killed off in the fight or left to starve. Even in the semi-civilized races, the worth of the individual to the community grows less in the declining years of his life, and the younger men who can bear arms, and endure the hardships of war and the chase, are given the preference in the struggles for existence. In exceptional cases, among savage tribes, where the chiefs are strong and vigorous and possessed of superior knowledge of value to the community, they are suffered to survive, and are frequently protected and cared for by their people even when well advanced in years.

In the highly civilized nations, where society, the institution, the government count for so much, he who can render the most valuable service to the community as a whole is most indispensable to its welfare.

Inasmuch as it now requires about thirty years, nearly an average lifetime, to prepare for the highest duties and responsibilities of citizenship in our present-day civilization, the services of men of age, experience, and accumulated wisdom have become more and more valuable to the community.

At the present time, property interest, established reputations, broader fields of observation, a greater financial power, and, above all, character, which are likely to be the possessions of men of age, take the place of the superior physical vigour and agility of the younger men, which figured so prominently in the early struggles for the maintenance of life.

One can recall numerous instances like Gladstone, Von Moltke, Bismarck, De Lesseps, Queen Victoria, Pope Leo, Herbert Spencer, Lord Salisbury, and many others who rendered great service to their fellow men after they had reached the age of threescore and ten.

The present age is so strenuous that there is a tendency on the part of men of affairs to carry the strains and burdens of life into their declining years.

They become so centred and absorbed in their great interests that they find it very difficult to relinquish them to younger men.

The habit of routine work, and the many ties that bind men to their business or professional associates, make it hard to leave the traces, and surrender one's position to others. Then, too, one's pride in his own powers, and a reluctance to admit even to himself that he is growing old, keep many a man in heavy harness when he should seek to lighten his burden. Unfortunately, some are compelled by misfortune or necessity to continue the struggle to the bitter end. Some of the most heroic, and at the same time pathetic cases that I have ever known, have been among men who have lost their pecuniary competency late in life, and have had to enter the battle anew.

It behooves every one to strive to lay by a sufficient sum of money, during his early or middle life, to see him safely through his declining years, and it also behooves every man to conserve his energy, and so husband his vital resources, that he may bring his organism to the close of life without a premature collapse or a sudden breakdown.

With the comforts and conveniences of modern life, the period of old age to a man in health should be a pleasant, if not a happy one. How to prolong one's service in life, and to grow old gracefully and happily, are attainments worth striving for.

I have already alluded to the necessity of lightening one's burden after the period of old age has fairly commenced. This does not mean that all physical and

mental activity should cease, or that a man should enter upon a prolonged period of rest. It simply means that he has passed the summit of his powers and has entered upon the decline. "From birth to maturity," says Doctor Humphry, in his book on old age, "there is an increase of bodily material, an increase of activity, an increase of strength; from maturity onward is a lessening of material, a lessening of activity, and a lessening of strength. As in the early stages of development the material absorbed and the strength attained were in proportion to the requirements, and all the organs and tissues of the body adapted themselves to the demands made upon them, so in the later stages, as age advances, there is the same harmonious adjustment of the organs and parts to the lessening weight and the diminishing energy and activity that is taking place.

"During the time that the bones are becoming lighter and less capable of offering resistance, the muscles become, in like proportion, lighter and weaker, and with a narrowing range of action, and the associated volitional and other nerve apparatus exhibits a corresponding lowering of energy and force. The loss of will to run and jump and indulge in athletic sports is, or should be, commensurate with the inability of the muscles to effect the requisite movements, and of the bones to bear the requisite shocks.

"The weakening of the heart and the diminished elasticity of the arteries provide a proportionately feebler blood-current; and a lower digestive power, and a less-

ened appetite provide a smaller supply of fuel, to feed, not enough to choke, the slowing fires. Thus the capacity for action is diminishing, and the demand for it and the material for it are diminishing also; and all are diminishing in due ratio to one another. It may be said, indeed, that at all periods of life, the healthy and well-working, and especially the enduring, quality of the body, depends upon a good adjustment, a good balance, of the several parts; and it is upon the well-ordered, proportionately or developmentally regulated decline in the several organs that the stages which succeed to maturity are safely passed, and that crown of physical glory, a healthy old age, is attained.

"A time comes at length when, in the course of the descending developmental processes, the several components of the machine gradually grow weaker and slow down, a time when the nervous, the circulatory, and the respiratory organs have not force enough to keep one another going; then the wheels stop like those of a watch or clock, and a physiological death terminates the physiological decay."

In order to meet these gradual changes in the system as one advances toward old age, the whole organism should be gradually slowed down. Less and less demands should be made upon all of the bodily functions, but more and more attention should be paid to fresh air, sunlight, proper food, clothing, bathing, and immediate environment.

Gentle, all-round activity of body and mind, followed by frequent intervals of rest, should be the rule. Nothing in excess. In order to meet the specific changes that are taking place in the bones, muscles, tendons, arteries, heart, lungs, nervous system, etc., special precautions should be observed in taking any kind of exercise.

Exercises and games that require sudden, quick, and forceful efforts, like boxing, tennis, hand-ball, etc., should be avoided. Exercises that require extensive body bending, reaching, and stretching, although admirable as a means of warding off some of the infirmities of old age, should also be avoided after the evidences of old age have become established.

Fencing, dancing, and exercises of skill which keep the nervous system under great tension, should be abandoned, also rapid walking, running, bicycling, rowing, swimming, horseback riding, basket-ball, and all exercises and sports that bring great strain upon the lungs, heart, and blood-vessels. Cricket, golf, bowling, bicycling, and other exercises that may be followed in moderation, may be continued up to seventy or eighty years of age.

The safest exercises, however, are walking, carriage-riding, billiards, etc., that give gentle activity to body and mind, and may be indulged in great moderation.

As in infancy and early childhood all exercises began with simple movements of the arms, trunk, and legs, so as age advances, and one returns to second childhood, these simple movements should again be relied upon to

keep up life's current, and promote the necessary tissue changes upon which health in old age so much depends.

We have seen that movements taken without apparatus are very vigorous and tax the heart and lungs to a considerable extent, because so many muscles are brought into action. The best selection of movements for elderly persons are given at the close of this chapter.

These should be practised daily with great care and moderation, taking the slowest rhythms, and pausing frequently for rest. At the same time, one should enter with the heartiest interest into the affairs of life, making the home exercise supply what the day's work does not afford. Hold on to life tenaciously, and life will hold on to you.

EXERCISES FOR ELDERLY MEN

1. Measuring Tape.
2. Paddling Canoe.
3. Rocking the Boat.
4. Swimming (Breast Stroke).
5. Chicken Wings.
6. Tree Swaying.
7. Mowing.
8. Fencing.
9. Striking the Anvil.
10. Adoration.
11. Windmill.
12. Pitching Hay.
13. Archery Movement.
14. Signal Station.
15. Driving Stakes.
16. Pulling Rope.
17. Bowling.
18. Restoration.

CHAPTER XIII.

FRESH AIR AND BREATHING EXERCISES

A MAN breathes upon the average about twenty times a minute, or 28,800 times every twenty-four hours.

Any function of the body that requires this incessant activity day and night must be an important one. If one is deprived of air even for a short time, a feeling of suffocation immediately ensues, and if the air is withheld from the lungs for a few minutes more, life itself becomes extinct.

Several historical incidences are on record where a large number of persons died in a very short time from breathing impure air. In the Black Hole at Calcutta, of the 146 persons confined, 123 died in one night. In a prison in which three hundred Austrian prisoners were placed after the battle of Austerlitz, 260 died very rapidly. The steamer *Londonderry* had a large number of emigrants confined below during a storm; when the hatches were raised, most of them were found dead. The reason that air which has once been breathed is so deadly is because it has lost a large part of its oxygen, which is a life-giving

property, and taken on an increased amount of carbonic acid and organic substances which are rank poisons.

Under ordinary circumstances, the air breathed is vitiated so slowly that its poisonous effects are not perceived. The sense of smell becomes blunted and inert, a little mental dulness, drowsiness, and some headache perhaps, are the only warning symptoms, and these are often attributed to other causes.

It is the inability of most persons to detect any injurious properties in the air breathed that makes them so indifferent to the ventilation of their workshops and living-rooms.

Most persons are, however, very sensitive to draughts of cool air, and consequently tend to regulate the quality of air breathed by its temperature rather than by its purity and freshness. If a person feels cold, nothing seems more natural than to close the doors and windows and stop the ingress of the outside air. In so doing, of course, the fresh air is not only kept out, but the impure air that has been breathed is kept in, to be breathed over and over again. Thus persons who would think it highly objectionable to bathe their bodies in water that had been bathed in by others, frequently take into their lungs air which has been repeatedly used again and again. From a vital standpoint the former process, though not pleasant, is not injurious, whereas the latter process is vitally harmful.

It is estimated that forty per cent. of the total mortality is caused by breathing impure air.

Yet as long as people herd together in cities and towns,

as is the custom in all civilized communities, a certain amount of vitiated air must necessarily be breathed. The great problem in ventilation is to supply as much fresh air as possible and reduce the amount of impure air to a minimum.

The best way of obtaining fresh air is to secure for each person as large a volume of air to breathe as is practicable.

Under ordinary circumstances, each individual requires about four hundred cubic feet of air every twenty-four hours. Each person should have at least 250 cubic feet of air-space in every school or recitation-room, three hundred cubic feet in his sleeping-room, four hundred cubic feet in his dwelling, office, or study-room, and one thousand in his work or exercise room. Even when this large volume of air can be secured for each individual, it would soon become foul unless it were frequently changed.

The best way to change the air in a room is to open the windows and doors occasionally and let the wind blow through. The windows should always be opened a little at the top and bottom when the room is occupied. By putting a narrow strip of board at the bottom of the window-frame, the current of air may be directed upward so as to protect one from draughts. A curtain at the top of the window or a screen may serve the same purpose.

A few practical hints as to the management of the air for breathing and living purposes may be serviceable. Keep the temperature of your room as near as possible to

the mean temperature of the climate in which you live. The best temperature for health and work is between 60° and 70° F. Open fireplaces or Franklin grates are preferable to hot-air furnaces or air-tight stoves. When steam-radiators are used it is advisable to have a pan of water placed upon them, so that the evaporation from the heated water will render the air less dry.

It is much more hygienic, as well as much more economical, to try and keep the body warm through an increase of clothing rather than an increase of external heat. To the young and vigorous, continued heat is more injurious than continued cold.

Cultivate the habit of breathing through the nose at all times. Do not talk in the cold air immediately after being in a warm room. On the other hand, it is better not to go immediately into a very warm room after running or riding in the cold air.

Either practice may give you all the symptoms of a bad cold in the head.

If possible secure a sleeping-room in which the direct rays of the sun enter sometime during the day.

Do not use the sleeping-room as a study, work, or living-room if any other room is available for these purposes. If compelled by circumstances to use the same room for working and sleeping, see that it is thoroughly aired every night before retiring.

Remember that every lighted lamp and every gas-burner consumes more oxygen than several persons, and make

allowance for an increased supply in ventilating your apartment in the evening.

Many persons, realizing the importance of fresh air, act upon the presumption that it is impossible to get too much of it. Respiratory experts, so called, make a specialty of what they term "breathing exercises," and all persons are advised to practise these exercises as a means of increasing their vital capacity and organic power.

Where the lungs are weak and there is any tendency or susceptibility to consumption, it is absolutely necessary that the person should have not only fresh air to breathe, but that he should frequently take long, deep breaths, and get as much pure air into his lungs as possible. It is also desirable for all persons, at all times, to keep the chest walls as flexible and mobile as they may, and to see that their respiratory apparatus is in good working order.

To base a system of physical training for every one, however, upon breathing exercises alone, and expect to build up the body generally by blowing into a spirometer, is a fallacy. It is a fallacy, however, built upon such a plausible foundation, backed by the dread of that very prevalent yet terrible disease, consumption, and by the fear that any attention given to the development of the muscular system detracts just so much from one's vitality, that a great many persons confine their physical training to breathing or lung exercises. This is a perversion of physiological truth which should not be allowed to go unchallenged.

The primary object of respiratory activity is not simply

to carry nourishment to the lungs, but to use the lungs as a sort of clearing-house, from which some of the oxygen of the inspired air could be sent to the rest of the body, and some of the carbonic acid received from this source could be eliminated from the system.

The amount of external respiration is always determined by the amount of internal respiration, that is, by the amount of chemical activity that takes place in the muscles and tissues of the general system.

Assuming that the total lung capacity of the average adult is 350 cubic inches, only about thirty cubic inches are required to satisfy the demands of ordinary inspiration. Should the person, however, engage in very violent efforts, such as are sometimes required in rowing, running, or swimming contests, then each inspiration and each expiration might be increased one hundred cubic inches, and the number of respirations a minute be greatly increased. This still leaves in the lungs over one hundred cubic inches of air, which no physical effort can expel.

This residual air, however, mingles freely with the air taken in at every inspiration, and effects the changes which take place between the air in the lungs and the blood in the capillaries. This exchange of oxygen and carbonic acid is always in proportion to the work being done, though persons in training can usually make greater efforts with less destruction of tissue. Every one is familiar with the fact that he breathes harder and faster when active than he does when he sits still. Doctor

Edward Smith found by experiments, made some years ago, the relative amount of air inspired during different forms of muscular exertion.

Thus, letting the amount inspired in the recumbent position at rest be taken as 1, —

Sitting posture required,	1.18
Standing posture required,	1.33
Walking one mile per hour,	1.90
Walking two miles per hour,	2.76
Walking three miles per hour,	3.22
Riding on horseback, trotting pace,	4.05
Swimming,	4.33
Running at six miles per hour,	7.00

From the above table it will be seen that breathing is largely an automatic process, designed to supply the system with air in proportion to its needs, which depend upon the condition of the blood. When the blood is less arterial and more venous, as is always the case when much work is being done, the respiratory centre is stimulated, and the breathing is increased. When, on the other hand, the blood is more arterial and less venous than usual, which is the case when the oxygen is not used up in combustion, because little work is being done, there is less demand for air, and the respiratory centre is depressed.

When an attempt is made through deep-breathing exercises to take in more air than the system needs, the

blood becomes more highly arterialized than is necessary, and the respiration is temporarily arrested. This is a condition known as apnœa. It shows that nature does not tolerate any interference with the regulation of her functions without a protest. It is not an unusual thing for persons to feel faint after taking a few deep inhalations, and I have seen young men drop to the floor in a temporary unconscious condition after persistently practising deep inhalations in front of an open window.

The absurdity of attempting to improve the general system through breathing exercises alone, is made doubly apparent when we consider how little the action of the heart is augmented by these exercises.

In rapid walking, running, swimming, or in any exercise bringing large numbers of muscles into action, the number of heart-beats is greatly increased, as well as the number of respirations. In very violent or prolonged exercises the heart sometimes beats as many as 160 times a minute, the normal number being about seventy-five or eighty.

The object of this increased action of the heart is to pump the arterialized blood more rapidly from the lungs to the tissues, where its oxygen is being rapidly used up, and back again from the tissues to the lungs, where the blood gives up its waste product in the form of carbonic acid, and takes on a renewed supply of oxygen.

The effectiveness of all muscle work depends upon the rapidity with which the tissue changes take place, and

this internal process depends upon the rapidity with which the gaseous changes we have referred to take place in the lungs. Both internal and external respiration are therefore dependent for their effectiveness upon the rapid beating of the heart.

When a person takes a number of deep inspirations, the blood is sucked as it were from the brain to the heart and lungs, but not in sufficient quantity to stimulate the heart to increased action so that it would send the blood quickly back to the brain again, consequently the feeling of faintness that often follows such practice.

If one would take the precaution to continue his respiratory exercise with some other form of exercise that quickens the action of the heart as well as the lungs, the process would be a perfectly natural one, and both heart and lungs would be invigorated at the same time. I have already suggested some of the exercises that are excellent for this purpose, such as rapid walking, hill climbing, dancing, running, skating, swimming, rowing, etc. All of these exercises may be supplemented by some of the free movements given in this book, which tend to limber up the cartilages of the ribs, render the walls of the chest more elastic, and develop the muscles of forced respiration. But to attempt to pump more oxygen into the system, thereby hoping to revitalize it, by practising deep-breathing exercises *only*, is folly, simply because the blood cannot absorb the increased supply of oxygen, and the system has no use for it.

HEALTH, STRENGTH, AND POWER

Exercises in this book that tend to develop heart and lung power:

1. Swimming.
2. Scooping Sand.
3. Steamboat.
4. Hoisting Sail.
5. Crouching Start.
6. Locomotive.
7. Signal Station.
8. Standing Start.
9. Swimming on Back.
10. Jumping-Jack.
11. Clap under Legs.
12. Lower Chest Expander.
13. Hand Fire-Engine.
14. Sawing Wood.
15. Rowing Movement.

CHAPTER XIV.

THE FOOD WE SHOULD EAT

EVERYTHING we do, whether it be work, exercise, or play, is done by expending energy. The very process of living, breathing, seeing, listening, thinking, and the action of the cells and glands involved in carrying on the functions of secretion, digestion, assimilation, etc., and the maintenance of animal heat, all call for the expenditure of force, which must be made good in the form of food, drink, and fresh air.

Every one is familiar with the fact that when he makes vigorous muscular efforts, he breathes faster, grows warmer, and perspires. That is to say, he gives off more water from the skin, more carbonic acid from the lungs, and more energy from every part, and if the efforts were long continued he would lose considerable weight. The amount of waste material given off, and the loss of weight, are in almost direct proportion to the efforts made, and the demands for food are regulated accordingly. Some of the competitors in athletic contests lose as much as ten pounds in a single race or game. Those who are young, and still growing and developing, require

much more food than adults, because their radiating or evaporating surfaces are much larger in proportion to their bulk, so that they lose more heat, and they need more material, as they have to build up the body as well as replenish what has been lost through exertion.

One of the principal objects of exercise is to break down old tissue, so that it may be replaced with new material. If, therefore, for any reason, mental and muscular efforts cannot be followed by the consumption of a sufficient amount of nutritious food to make good the waste, then such effort may prove injurious rather than beneficial. The relation, therefore, of food and diet to the proper growth and development of mind and body is an exceedingly important one. A perfect food must not only be capable of repairing the waste of the body, and supplying it with new building material, but it must also supply the heat and energy for doing nervous and muscular work. In order that a food may fulfil these functions, it must be made up of certain substances termed proteids, carbohydrates, fats, and mineral matters.

The proteids comprise the gluten of flour, the albumen of the white of egg, the fibrin of the blood, the casein of cheese, the syntonin which is the chief constituent of muscle, and other such building material.

The carbohydrates consist of the sugar, starch, dextrin, and gum found largely in the vegetables, such as potatoes, beets, carrots, parsnips, etc., and in cereals, such as oatmeal, Indian corn, rice, buckwheat, and others. The carbohy-

drates also abound in such dried fruits as apples, dates, figs, prunes, currants, and raisins.

The fats include many of the vegetable and animal fatty matters and oils. They are found in very small quantities in such vegetables as parsnips, artichokes, onions, and sweet potatoes, and somewhat more in the cereals, especially in oats, Indian corn, millet, and buckwheat, but they are found most abundantly in nuts, particularly the walnut, filberts, sweet almonds, and cocoanuts. The animal fats are found in the fatty meats, such as pork, bacon, mutton, and goose, and in milk, cream, cheese, butter, oleomargarine, and the yolk of eggs.

The mineral matters in our food include mainly the elements sodium, potassium, lime, iron, phosphorus, and chlorin. They are present to some extent in all ordinary foods, and are found in largest amounts in salted foods, because of the salt, in pulses, such as beans and peas, and in various sorts of nuts. The especially valuable salts are found in the outer layer of wheat, barley, and other grains.

Most foods contain one or more of these several ingredients. No single group fulfils all the body's needs, but each group fulfils some special function better than any other, so that something from all the groups is necessary for complete living.

The proteids, mineral matters, and water provide the raw material out of which the body is built up and repaired, while the proteids, carbohydrates, and fats, singly

or combined, furnish the potential energy for work and keep up the animal heat. Some physiologists claim that water, mineral matters, and fresh air should also be classified among the work and heat producers. The proteids perform both functions as tissue builders and energy and heat generators, and they are therefore considered the most important of all the foods. This fact is universally recognized by the natural appetite of the race, which leads them to crave some form of proteid with their other food selections, which are usually fats and carbohydrates. This is shown in such familiar combinations as bread and milk, crackers and cheese, bread and butter, pork and beans, ham and eggs, rice and milk, meat or fish and potatoes, bread and honey, cereals and cream, etc.

How much of the essential nutrients does each food contain? How much potential energy will it yield? Can it be readily prepared and easily digested? What does it cost? and how much of each shall we eat? These are all important questions, but they cannot be answered within the limits of a single chapter.

As to the kind and amount of food to consume, much depends upon the age, sex, climate, season, occupation, mode of life and environment, which we will briefly consider.

As a general rule, a child should eat about one part proteids, or building food, to every four parts carbohydrates and fats, or energy-producing foods, and an adult should eat about one part to five of the same nutrients.

The standard amount of foods for adults, as usually given, are as follows:

Proteids	125 granimes.
Fats	50 "
Carbohydrates	500 "

More recent experiments, however, have shown that if the food is thoroughly masticated at least one-half of this quantity is sufficient to furnish working energy for the average man.

A growing child, who is ever active, needs more food in proportion to his bulk than an adult, for reasons which I have already stated.

A developing youth, or young man practising athletics and gymnastics, requires a greater proportion of proteids, or body-building material, than a full-grown man, though he may be working at some laborious pursuit. The latter fares better under a greater relative increase of the carbohydrates and fats.

The proteids, especially the meats, seem to have the power of yielding a large amount of energy in a short space of time, and are consequently very desirable where short bursts of speed are required, or great feats of strength undertaken. Where prolonged activity is called for and great endurance expected, the carbohydrates and fats seem to give one more sustained power. The proteids form the chief essentials in the so-called training diet.

After the age of twenty-four the body has usually com-

pleted its growth and development, and there is less demand for the proteids as building material. Yet college athletes, and young men who were very vigorous and active in their teens and early twenties, tend to keep up their excessive feeding after they have discontinued their muscle work. The consequence is that many of these men break down with indigestion, and some of them become chronic dyspeptics. The remedy is a reduction in the amount of food consumed, especially the meat proteids, or a return to more active muscular work.

As one advances in age after thirty or forty years, there should be a gradual reduction in the amount of all kinds of food consumed, until the age of sixty or seventy, when one-half the usual amount of sustenance for adults will suffice.

As a rule, women need only about four-fifths as much food as men, because they average about six inches shorter and twenty-five pounds less in weight. Women as a class also have usually a greater amount of adipose tissue, and consequently give off less heat, which is an equivalent to the saving of so much food.

Persons exposed to the rigours of a cold climate have to consume more food. Sometimes an increased amount of clothing will help conserve the body's heat for awhile, but sooner or later it will be necessary to generate more heat. This is most quickly supplied by an increased quantity of the oils, fats, and carbohydrates. In very warm weather, or in going into a hot climate, the meats,

as well as the oils, fats, etc., consumed, should be reduced to a minimum, and the fruits, vegetables, and cereals should be relied upon mainly for sustenance. A person may acquire the habit of overeating, and then feel that he is not being sufficiently nourished because he does not feel a comfortable distention of the stomach.

Those who are engaged in laborious occupations or who are taking an unusual amount of physical exercise in the fresh air, may eat with impunity a great quantity of many different kinds of food, which could not be digested or even consumed without more or less distress by persons confined indoors and working at a sedentary occupation. Great muscular inactivity not only weakens the powers of digestion, but leaning over a desk, table, or bench, or wearing tight clothing or corsets about the waist, interfere with the action of the ribs, diaphragm and the stomach, and frequently cause dyspepsia. In order properly to perform their function, the stomach and abdominal viscera must not be cramped, and should have freedom of movement.

Many hints and suggestions in regard to diet, which have good physiological foundations, may be briefly condensed into a few paragraphs.

It is an excellent thing to begin the day by drinking a glass of hot water. If hot water cannot be secured, a glass of cold water will prove serviceable. The water will remove the mucous coating from the stomach and tone it up for the morning meal.

Eat slowly and masticate the food thoroughly. Time spent in chewing the food is time saved through the gain of nervous energy and the more perfect assimilation of all that is eaten.

When very tired or exhausted from overwork, postpone eating until you can secure an hour or two of rest. Great physical fatigue, prolonged anxiety, mental worry, or great emotional disturbance of any kind, frequently cause acute indigestion.

As a general rule, it is better not to read the morning mail or the morning newspaper before or at breakfast. Start the first meal of the day with the mind as free from thought, care, or anxiety as possible.

Never eat when in great haste. It will be less injurious to omit the noon meal entirely than to devour your food at a quick-lunch counter.

Give yourself up entirely to the enjoyment of every meal eaten for its own sake. A pleasant dining-room, with clean table-linen, fine service, and agreeable table companions enhance the enjoyment of eating.

Sugars and sweets are now considered an essential part of every one's diet. They should be eaten sparingly, however, and at meal-time, together with other food. If eaten between meals or in excessive quantities, they will cause acid fermentation in the stomach.

Sweets, like meats, may be eaten most freely by those who are accustomed to take vigorous physical exercise.

Cold water, not iced water, is the best form of drink,

because it is the best solvent for the solid substances taken as food. Tea and coffee, however, are drunk in moderation by many persons without any apparent injurious effects. Other persons cannot drink them without suffering loss of sleep and digestive disturbances.

Tea and coffee are in no sense muscle food, for experiments have shown that they increase rather than diminish tissue waste. For this reason persons who desire to be well developed and strong would better dispense with them.

If much heated and very thirsty from prolonged exertion, do not try to quench the thirst immediately. Rinse the mouth, gargle the throat, and take a few swallows of water. Then wait for fifteen or twenty minutes, when you may begin to drink all that you need.

Individual idiosyncrasies and peculiarities are so numerous and varied that it is not safe to lay down any absolute rules in regard to the quantity or quality of one's diet.

Very little is really known about the chemistry of nutrition, but we do know that during the growing and developing period nature provides for a surplus of food, but not for a deficiency. Therefore, it is better in youth and early manhood to eat abundantly of a mixed diet, and trust to the digestive apparatus to make the final analysis and selection of what is best for the sytem, and to exclude what is not fit for assimilation.

In a healthy person, the appetite, if not perverted by

stimulants, condiments, etc., should be a safe guide to the choice of foods. Bearing in mind the tendency after middle life to overeat, it is better to take the mixed and varied diet necessary from meal to meal and day to day, rather than a succession of dishes or courses at one meal.

Ascertain what should be your weight for your race and sex in proportion to your age, height, chest girth, etc., and allow yourself to vary but a few pounds from this standard.

Bear in mind, however, that, while the normal weight may be preserved by having a surplus of flesh in one part of the body, some other part may be impoverished from want of suitable nutriment.

The best way to distribute the body's nutriment to the parts most needing it, is through a system of carefully selected physical exercises, such as are described herein.

Increase in weight after forty is not an indication of good health, as so many suppose, but of approaching disease. If you value your life and wish to prolong it, keep down your *waist girth* as you advance in years.

The best method of treating extreme leanness and obesity I will consider in the succeeding chapter.

CHAPTER XV.

OBESITY AND LEANNESS

WHEN the accumulation of fat becomes so excessive as to interfere with the performance of the various functions of the body, it is termed obesity.

We have seen in the previous chapter that as soon as the amount of food eaten is in excess of what is expended through activity, that there is a tendency to take on fat. This is particularly the case in persons of both sexes who have been active and energetic in youth and early adult life, thereby cultivating an appetite and acquiring good digestion, but who, as they become more prosperous, cease to be so active, while they continue the excessive feeding.

Some authorities maintain that a moderate accumulation of adipose in middle life is an indication of health, and that this increase of fat is simply one of nature's methods of conserving the heat and vital force that is generated so slowly and lost so rapidly in old age.

We know that a certain amount of fat enters into the composition of the body in health, and that all persons possess more or less of it. According to Huxley, a man

weighing 154 pounds would have about sixty-eight pounds of muscle, twenty-four pounds of skeleton, and twenty-eight pounds of fat. Here fat is used in the gross sense of adipose tissue, not of pure fat in the chemical sense, which in the above case would amount to about seven pounds only.

In women the proportion of fat to bone and muscle is usually much greater.

As fat is the most unstable of all the tissues that enter into the structure of the body, it is the tissue that is most likely to fluctuate in quantity, and influence most potently the loss or gain in body weight.

How great this fluctuation is, few persons realize.

The insurance companies allow a variation of twenty per cent. from the normal weight, other things being favourable, before considering a person ineligible.

This variation would allow a person whose normal weight was 150 pounds to drop to 120 pounds, or raise his weight to 180 pounds, before passing the physiological limit.

In my opinion, however, any marked deviation from the normal weight for a given age and height indicates a deviation from perfect health.

The best type of man for all-round service is one who weighs from 2 to 2.5 pounds to every inch in height, and the most capable women are those who range in weight from 1.8 to 2.3 pounds to each inch in height. In order to determine your own factor in this particular, divide

your weight in pounds by your height in inches. Thus, if your weight is 136 pounds and your height is sixty-eight inches, your weight-height factor is two pounds to the inch.

Any weight above two and one-half pounds to the inch in stature may be considered excessive, inasmuch as it adds little or nothing to one's mental or physical efficiency, and any weight above three pounds to the inch in stature should be regarded in the nature of corpulence or obesity.

The causes of this disagreeable condition are many, but the chief causes are heredity and excessive eating. About fifty per cent. of the persons who become corpulent inherit the tendency directly from one of their near or remote ancestry. Some families tend to fat, others to leanness, and where the tendency is to fat, it is very difficult to keep the person within normal limits, as everything consumed seems, though moderate in quantity, to tend to adipose tissue.

The other fifty per cent. really acquire corpulence by eating large quantities of all kinds of foods, but especially those that are rich in fats and carbohydrates. The sugars and starchy matters are particularly disposed to produce fat.

Diminished physical activity is also a very frequent cause of obesity in both sexes, and two-thirds of all the corpulent persons are women. Women who have borne many children are apt to become corpulent after forty or fifty years of age.

Diminished mental activity and the acquirement of indolent habits and a phlegmatic, easy-going disposition are also causes. The reduction of respiratory activity, through the interference of the accumulated abdominal fat with the action of the diaphragm, tends to a further increase in adipose tissue, which might otherwise be oxidized through the lungs.

Breathlessness is a condition arising not only from an excess of fat, but a condition which is likely to occasion a further deposit of it.

Fat is a bad conductor of heat, therefore much of the warmth generated in the body, which usually passes off through radiation, is checked in the obese by the subcutaneous layer of fat that surrounds them. This retention of animal heat leads to a further accumulation of fat, which accounts for the fact that a rise in external temperature, or acute fevers or pneumonia, are very hard to bear by persons who are corpulent.

Another cause that favours the deposition and conservation of fat in the body is the consumption of alcohol. This is so readily oxidized or turned into heat, that it prevents the fat in the foods being burned, so they accumulate in the body.

An anæmic condition of the blood, occasioned by a reduction in the number of red blood corpuscles, and indicated by blanched lips, pale face, etc., lessens the decomposition of fat through oxidation, and thus leads to its accumulation. It was observed by Aristotle in

ancient times that the fattening of cattle was aided by occasional bleeding and by intervening periods of hunger.

It is also commonly observed at the present time that many persons are fat because they have relatively less blood than the lean, and that women are usually fatter than men because they have fewer red blood corpuscles.

The diseases that follow obesity may affect the brain, heart, lungs, stomach, liver, kidneys, or blood-vessels, and are usually hard to bear on account of the excessive fat. How to reduce corpulence, therefore, is not simply a matter of securing a more comfortable existence; it is a matter of keeping off impending disease and an early death.

From what we have learned to be the cause of corpulence, the remedy would seem to suggest itself. *Eat less and burn up more.*

When fat first begins to accumulate, this is a comparatively simple thing to do, as is illustrated frequently by athletes, who reduce their weight by training.

But after corpulence is established, and the person weighs fifty or a hundred pounds more than he should for his stature, it is often a perplexing problem, particularly if the tendency is inherited, and the person is advanced beyond middle life. As we have already intimated, a person who is corpulent gets into a vicious circle from which it is almost impossible to extricate himself. Increased weight calls for greater expenditure of energy

in moving about, increased expenditure of energy increases the appetite, more food creates more fat, and more fat tends to increase the accumulation of fat by interfering with the normal processes of oxidation and combustion.

Nevertheless, if a person has the resolution and determination to continue the treatment, a great reduction in weight may be secured without loss of health.

One of the first essentials is to reduce uniformly but moderately all articles of food, but especially the fats and carbohydrates. This means a reduction in the usual supply of bread, milk, butter, sugar, potatoes, rich puddings, pastry, and fat meats. If there is any one food that you like better than another, and have eaten to excess, that is likely to be an offender whose further acquaintance you should dispense with.

Reduce the total amount of liquid to two or three pints a day, unless you perspire very freely, when another pint may be drunk. This drink may be made up of one cup of weak tea or coffee (which will stimulate the circulation), and water enough to make up the balance. The amount of water taken at meal-times should be reduced to a minimum, as it tends to increase the desire for food.

Eat less than your appetite craves. Leave the table hungry. You will not starve, but simply make up the deficiency which your system may need by living upon your accumulated capital of fat and adipose tissue.

Weigh yourself every few days, and if you can reduce your weight two or three pounds a week, the result will be better in the end than to strive for a more rapid reduction.

In order to increase the oxidation of the body fats, the person must lead a life of great mental and muscular activity. This is nature's only way of getting rid of her surplus. Such activity increases the circulation of the blood and the breaking down of tissue. Exercises like running, rowing, swimming, boxing, hand-ball, tennis, and basket-ball, are the best for reducing the weight, because they call for mental and physical alertness, and make you breathe five or six times as much as you do when sitting still, and it is the rapid breathing that furnishes the increased oxygen that burns up the fat. Such exercises create a forced draught, as it were, and make the internal fires burn more briskly.

Unfortunately, there are many corpulent persons who have not a sufficient amount of physical vigour and nerve-force to keep up the pace required in the exercises I have just mentioned.

Such persons, however, may find great benefit from engaging in exercises that require less intense activity, but may be indulged in for a longer time, such as golf, cricket, bicycling, horseback riding, and hill climbing.

Although fat goes on increasing daily, the opportunities for reducing it by exercise are unfortunately limited by seasons, weather, want of proper facilities, and other

extraneous conditions, over which one may have no control.

To such persons who have the pluck and determination necessary to get rid of their burden, many of the exercises described and illustrated herein will be of the greatest service. They may be practised daily under all conditions of weather or seasons, wherever one can find standing-room and good air to breathe. The best exercises for reducing the weight are as follows: Chopping Wood, Striking the Anvil, Scooping Sand, Steamboat, Hoisting and Furling Sail, Windmill, Locomotive, Grand Bend, Pitching Hay, Standing Start, Jumping-Jack, Driving Stakes, Clap under Legs, Lower Chest Expander, The Long Pass, Sawing Wood, Hurrah, Rowing, and Rocking the Boat.

In training for the reduction of fat, it is always advisable to carry the exercises to the perspiring stage. After this take a warm bath with a profuse use of soap, which should be followed immediately with a cold bath of sufficient duration to deprive the body of any sense of heat.

The condition of the skin is of the utmost importance to the corpulent, and everything should be done through frequent bathing and rubbing of the surface to keep it up to the highest state of functional activity, as it is through the skin that the evolution of heat takes place which helps to eliminate the fat. For this reason, though sweaters and heavy clothing may be used while exer-

cising, to favour perspiration, as light clothing as possible should be worn at other times, and very few bedclothes should be made to suffice.

The amount of sleep should be reduced to seven hours at the most, so as to prolong the hours of mental and physical activity.

In case the corpulent person is feeble and debilitated, having anæmia or some heart weakness, it would be better to consult a physician who makes a specialty of treating such cases.

LEANNESS

In case of excessive leanness, the cause and treatment are very nearly opposite from what we have observed in obesity. As a general thing, any amount of food taken in excess of what is used up daily in the activities of life will be deposited as fat. There are, however, many persons who, for some reason or other, fail to assimilate a large portion of what they eat, and consequently they remain thin, or at least, never gain fat. One may readily recall among his acquaintances some lean and cadaverous-looking individual who easily consumes much more food than his fat neighbour. Such cases, however, must be regarded as exceptional.

Persons who are lean are undoubtedly much more active than those who are fat, and they usually expend a great deal more energy.

"A lean dog for a race" is a familiar saying, and long-distance runners often try to reduce their weight to a minimum, in order to reserve their power.

It is a question, however, whether athletes who train down "too fine," as it is termed, do not often lose more energy through excessive radiation of heat from loss of surface fat than they save in power through reduction of their weight. In such cases it is often necessary to reduce the amount of exercise, and to feed them up for a few days with stimulants and fattening food instead of training them down.

A great many persons are in the condition of athletes who are overtrained. They are expending more energy through loss of heat and overwork than they can make good with their food. The best treatment for these cases is to reduce the amount of mental and physical activity, cut out from their lives as far as possible all sources of anxiety and worry, give them frequent intervals of rest, prolong the sleeping period to nine or ten hours, and see that they are always warmly clothed.

Having reduced the expenditure of heat and energy to a minimum, the next important step is to try to bring the lean person up to normal weight. If the stomach and digestive apparatus are in good condition, an increased amount of the fats and carbohydrates should be added to the dietary. According to Munk, in order to ensure the laying on of fat, the daily diet should be made up of these proportions: 90 to 100 grammes of fat, 100 to 110

of proteid, and about 500 grammes of carbohydrates. We have seen that the standard amount of the different food constituents required daily for the average adult are 125 grammes of proteids, 500 of carbohydrates, and 50 of fats. In the diet for the lean person, therefore, the amount of fats has been doubled, the proteids slightly diminished, while the carbohydrates remain the same. The heat-generating property of the lean man's diet, however, is considerably increased on account of the larger amount of fats prescribed.

If the person has poorly developed muscles and little energy, the amount of proteids should be increased, as it is difficult to make muscle as well as fat without them. If the person has a poor appetite, and cannot eat the prescribed amount of food in three meals, it may be given in four or even five.

Where there is sufficient strength, a systematic course of all-round physical exercise for one or two weeks at a time, followed by equal periods of rest, sometimes accomplishes remarkable results. The theory being that the exercise greatly improves the appetite, which may be indulged freely during the week of freedom from so much activity, so that the gain gradually exceeds the loss.

This is one reason that athletes are so prone to increase in weight after they have ceased training. The same principle may be applied to any kind of mental and physical activity that may be divided into alternate weekly or monthly periods of activity and rest.

By rest in this sense we mean a release from exercise as such, and a reduction in the average daily amount of one's mental and physical efforts. In fact, this is the rhythmic way in which many of us work.

CHAPTER XVI.

BATHS AND BATHING

NEXT to exercise, bathing is one of the most important means to health with which we have to treat. This is not alone because "cleanliness is indeed next to godliness," but because of the manifold functions of the skin, the part of the body to which bathing is applied.

The skin protects the soft and sensitive parts of the body from mechanical injury, also from the effects of excessive heat and cold. It has something like two and one-half millions of sweat-tubules, aggregating several miles in length. Through these sweat-tubules the skin throws off from ten to fifteen thousand grains of material daily, and by profuse sweating the weight of the body is often reduced from two to five pounds in an hour.

The under layer of skin is also covered with a complete network of blood-vessels, spreading over a surface of nearly fifteen square feet. The skin also has thousands of little elevations just beneath the surface, containing the nerve-endings, which are the organs of touch and sensation. There are also numerous oil-glands, which are constantly giving off a fatty secretion, which serves to

lubricate the skin and aid in the exclusion of extraneous fluids and gases. Thus the skin may be considered not only a protective organ, but a vascular organ, a nervous organ, and a glandular organ.

In this fourfold capacity, the skin exerts a great influence over the health and functions of all the other organs and parts of the body. In treating the skin, these several functions must be borne in mind. By keeping it in good condition as a protective organ, the skin becomes neither super-sensitive or inert, but readily thickens or shrinks in response to surface-contact, and regulates the temperature of the body by the dilatation or contraction of the blood-vessels and the sweat-glands. As a vascular organ, the skin may be used as a great reservoir to draw the blood from the brain to relieve congestion. This effect may be produced by hot baths.

As a glandular organ, the skin serves to reduce the amount of water, saline matter, and carbonic acid in the tissues. In this respect the skin partakes of the nature of the kidneys. The skin also takes in oxygen and gives out carbonic acid and water; herein the skin resembles the lungs in its function as a respiratory organ. An active skin, therefore, may be made to relieve the work both of the lungs and kidneys; on the other hand, an inert condition of the skin may allow it to become suddenly chilled, thus checking its secretions and driving a large amount of blood into the interior, and causing congestion of some of the internal organs, as is usually

the case when one contracts a bad cold. The sweat-glands, blood-vessels, and surface of the skin are greatly under the influence of the nervous system, as is shown by the well-known effects of emotion in sometimes suppressing the perspiration, and sometimes causing it to pour forth in abundance, also in excluding the blood from the skin as in the blanching of fear, or in bringing it profusely to the surface as in the blushing of shame.

The connection between the nervous centres and the skin is shown also in what is known as "goose flesh," which may be caused by emotion, although it is more usually caused by the application of cold to the skin. In fact, the skin is capable of producing as great an influence on the nerve-centres as the nerve-centres produce upon the skin. Familiar illustrations are the involuntary muscular movements caused by tickling the soles of the feet, by laughter, or in a shivering and a chattering of the teeth when cold, or in sighing or gasping for breath when water is sprinkled upon the face or chest. Much of the soothing effect of massage may be attributed to the same cause. These are all examples of reflex movements due to the influence of contact upon the nerves of the skin. As many of the results of bathing are produced by reflex action, the importance of the skin as a nervous organ must always be kept in mind.

How to keep the skin in perfect condition in view of its many functions, and make it contribute to the best

good of the general system, is the problem before us. We have seen that the skin, as a secreting and glandular organ, is constantly giving off waste substances in the form of epidermic scales, sweat, and oily matter, which, combined with the dust and dirt floating in the air or rubbed off from the objects with which we come in contact or which we handle, constitute an ever present source of defilement. This surface dirt must be removed, or it will clog the pores of the skin, and interfere with its function as a glandular and respiratory organ. The best way to remove surface dirt, as all civilized peoples know, is by the use of warm water and soap. The warm water relaxes the tissues of the skin and opens the pores, while the alkali of the soap breaks up and dissolves the oily matter which is sticking to the surface. Such parts as the hands, face, and neck should be so washed two or three times a day, according to the amount of exposure, and the armpits, feet, and groins at least once a day, preferably at night before retiring.

The amount of soap to be used depends a great deal upon the condition of the skin. If the skin is coarse and oily, and the person perspires freely, more soap is necessary than where the skin is delicate and more or less inactive. In the former case, however, the person may be physiologically cleaner than the latter, who frequently bathes the surface of the skin with highly perfumed soaps, while the inert sweat-glands and tubules may be clogged with internal filth. It is a question if a person whose

skin is so inactive that it never perspires is ever really clean.

To keep the skin in excellent condition, nothing is better than frequent exposure to fresh air and sunshine, and frequent perspiration from exercise, followed by warm and cold bathing and gentle and persistent rubbing with the open hands.

Under ordinary circumstances, where the person does not perspire freely, a warm tub bath should be taken at least once a week for cleanliness. If the skin is dry and scaly, soap should not be used profusely, as it tends to rob the skin of its oily matter, which serves to keep it soft and smooth. Soaps containing olive oil, like the pure Castile and similar makes, are best for all skins, because they tend to keep them supple and velvety. The warm tub bath should usually be taken at night, just before retiring. It is an excellent thing to relax the tissues and take the soreness out of the muscles, after one has been undergoing an unusual amount of exercise. If taken during the day, when one is likely to go out into the open air, the warm bath should be immediately followed by a cool bath. One of the most refreshing baths, usually taken in the morning, is a cold sponge bath. This may be enjoyed all the year round by any person in health. It is a bath, however, which should usually follow one's morning exercises, when the skin is all aglow with the blood brought to the surface through the action of the muscles. The safest way to take the sponge bath is by instalments.

Fill your bathtub half-full of water while you are washing your hands, face, neck, ears, and armpits at the bowl with warm water and soap. Then take your big sponge, and, while leaning over the tub, bathe the face, head, and neck with a profusion of cold water; then bathe the left arm, right arm, and chest. Now squeeze out the sponge, stand erect, and bathe the abdomen, lower back, and sides. Then step into the tub with the left foot and sponge the left leg two or three times with a profusion of cold water. Now take out the left foot, and do the same with the right foot and leg. Then sit down on the edge of the tub and sponge the small of the back and buttocks, finishing up by squeezing a spongeful of cold water on the back of the neck and shoulders and letting it run down the spine. By this time you will begin to experience a feeling of warmth, and can rub down and dress at leisure. One of the advantages of taking a sponge bath in this way is that you avoid a shock, and, by bathing the least sensitive parts first, you start an immediate reaction, that tends to lessen the feeling of cold in the more sensitive parts.

One reason that many persons do not enjoy a cold sponge bath is because they are never warm when it is taken. This is a great mistake. If you do not warm up by exercise, you should rub the whole surface of the body for five or ten minutes with a rough Turkish towel, until the skin is in a glow, before dipping into the cold water. This preparation is especially desirable if the person is

advanced in years, or if, for any reason, the circulation is feeble. The usual rubbing down with a rough towel should follow the cold sponge bath, even though the skin rubbing has preceded it. The first rubbing before the bath should be thorough and systematic enough to stimulate the action of the heart and lungs somewhat, as well as the skin, and in a measure take the place of physical exercise.

As a general rule, for most persons, though in health, it is better not to submerge the whole body in winter in a cold bath. The shock to the system is too severe. For the same reason the once favoured cold shower-bath is coming into ill repute. An excellent substitute for both the tub and the shower is the douche-bath. In most gymnasiums and in many private houses this bath is taken by the use of a piece of one-half to one inch rubber hose about four feet in length, attached to a cold water faucet. By the use of this hose, the water may be directed to any part of the body with more or less force, and the fineness and coarseness of the stream may be easily regulated by the pressure of the hand and fingers upon the hose, which for this reason should be used without a pipe or nozzle.

As the effects of all kinds of baths are produced principally through the impressions made upon the cutaneous nerves, douching, spraying, and dividing the stream of water in any way adds to the intensity of the shock, especially if the bath is given to the whole body at one

time. The length of the exposure, also, is another factor to be taken into consideration, as this tends to further intensify the effect of the bath.

As persons are constituted differently, and as there are varying conditions when baths may or may not be taken, a few words of caution may be of importance.

Never hesitate to take a cold bath after exercise if you are warm, or even perspiring freely — unless you are very tired, or fatigued from long-continued efforts, when it is better to take a warm bath.

If the surface of the body is cold, as sometimes happens after riding a bicycle thinly clad, in a head wind, it is better to take a warm bath or to rub down with a Turkish towel without bathing at all.

Do not bathe within two hours after eating, or when conscious of being hungry.

Bathing after exercise may better be taken while standing, rather than sitting or lying at length in a bath-tub.

Where persons are trained down very thin, as is the case with some athletes, a large amount of blood is brought near the surface of the skin. Under these circumstances long exposure to cold water, as in sea-bathing, is highly injurious. Even women with plenty of adipose tissue endure the cold water much better than athletic men.

If a person is conscious of having any heart trouble, it is advisable to omit hot or cold baths altogether, and

never to completely submerge the body in water at any time.

Persons advanced in years, or with defective circulations, may sometimes get very good effects from a few minutes' exposure to a cold air bath, followed by vigorous rubbing with a Turkish towel in a warm room. Remember that the rubbing is fully as efficacious as the bathing, and where one must be omitted, it would better be the latter.

CHAPTER XVII.

THE FUNCTIONS OF CLOTHING

In the chapter on bathing, I spoke of the important part played by the skin, on account of its manifold functions. One of these functions we learned was to protect the body from external injuries and discomforts, and to regulate the body temperature. It is principally to aid the skin in the performance of this function that clothing is used. Of course there are other motives, such as are dictated by modesty, fashion, and the efforts to decorate and adorn the person. Although these latter motives receive more consideration from the general public than the former, they are, from a hygienic point of view, of secondary importance.

Inasmuch as fully eighty per cent. of all the food consumed is required simply to keep up the animal heat of the body, upon which the vital functions depend, that is, to preserve the normal temperature at 98.6° F., it will be seen that the surface of the body, from which seventy per cent. of this heat is lost, needs some protection from the wind, rain, snow, and extremes of weather to which man is so frequently exposed. When the skin is in a

good condition, it readily adapts itself to the extremes of heat or cold, as one may observe in going from a hot to a cold bath, or the reverse, or from a hot to a cold climate. This is because the skin, in a healthy state, is a splendid non-conductor. If, however, the skin is rendered inert through the use of too much clothing, or unfit clothing, it loses to a certain extent its non-conducting properties and one quickly feels the slightest change in the temperature. This condition has led some travellers to observe, that they have suffered more from heat in Greenland than they have from heat in Florida, and more from cold in Florida than they have from cold in Greenland.

The kind, amount, and form of the clothing worn, therefore, are matters worthy of careful attention. The principal object of clothing being to protect the body from the extremes of heat and cold, the non-conducting materials are the most serviceable. These are the woollens, furs, downs, silks, cottons and linens in the order of their importance.

The colour of the material worn makes little difference in regard to the amount of heat radiating from the body. The amount of heat received from the sun, however, is very much influenced by the colour. The blacks and the darker colours receive the most heat, and the whites and paler colours the least. For this reason dark colours are best worn in the fall and winter, and the light colours in the spring and summer.

The looser the texture, and the more loosely fitting the

clothing, other things being equal, the more heat they retain. This is because the air which permeates loose woven fabrics is itself a non-conductor and helps retain the body's heat. For the same reason, two shirts worn over each other are warmer than the same material made into one garment, just as double windows on a house, with a layer of air between, are warmer than single windows, of double the thickness of glass. The gauze, open-mesh, and knit underclothing, for the same reason, though made of cotton or linen, are frequently better conservers of heat then the tight-fitting closely woven woollens.

For the young and vigorous, underclothing that allows a free circulation of air, made from any material, is much to be preferred to the heavy flannels, so frequently recommended. If a person is in feeble health, or has a poor circulation, or is advancing in years, light flannel or cotton-wool underclothing may be preferable.

If a person perspires freely, or is exposed to sudden changes of temperature, where no opportunity to rub down or change one's underclothing is presented, it is much better to wear woollen of some description. This has been shown by the experience of men in the army and navy, by firemen, icemen, boatmen, and athletes. Business and professional men, however, and those who are engaged in sedentary and indoor occupations, are living all the year round in a mean temperature of about 70° F., and consequently have no occasion to keep their bodies constantly bathed in a profuse perspiration. The insen-

sible perspiration which is constantly taking place in a healthy skin, is better taken care of by underclothing which allows a freer circulation of air.

In case one does get overheated, a woollen overgarment or jersey should always be put on to prevent the body from chilling too suddenly, and a rub down and change of underclothing should be resorted to as soon as possible.

It is just as necessary to have the outer garments permeable to the air as it is to have the underclothing so made as to secure a free circulation of it. For this reason India rubber garments and water-proof clothing should never be worn long at a time. Although garments made from water-proof material are excellent for protecting the body from the wind and the rain, they are objectionable as articles of clothing, as generally made, because they are very warm, and confine the watery vapour that is given off as insensible perspiration from the skin. In this way the underclothing may be protected from a wetting from without, while it is saturated with moisture from within. For the same reason, rubber boots, rubber overshoes, and "sneakers," so called, are objectionable, and should only be worn when absolutely necessary to protect the feet from a soaking.

If exposed to cold, damp, winter weather, in walking, riding, or standing, especially if there is loose snow or slush on the ground, it is better to be clothed with a heavy overcoat and overshoes. If the weather is simply cold and brisk, however, and the walking good, heavy

overcoats and overshoes may be dispensed with, where one is only exposed for a few minutes, as in crossing the street or in passing from one hall to another as at school or college. If one is walking or running in the open winter air for exercise, where he is expected to make sufficient effort to keep up a vigorous circulation of the blood, it is also desirable that he should dispense with overshoes and overcoat. Many persons clothe themselves so heavily when they walk out for exercise, that they get into a perspiration and take cold as soon as they return to their room and take off their overclothing. In recent years, especially in many of the schools, colleges, and city athletic clubs, some of the aspirants for athletic honours have gone to the other extreme in regard to their clothing while exercising, and only wear a sleeveless cotton undershirt, and a pair of thin cotton running-breeches, and a pair of running-shoes. Undoubtedly this freedom from the restraints of clothing while running adds greatly to one's speed, and in indoor meetings, or, in the spring, summer, and fall, out-of-doors, may be unobjectionable, but to bare the arms and legs and only give the body the protection of a thin cotton undershirt during the winter months of a northern climate, while running in the open air, is not only inadvisable from a hygienic standpoint, but from an athletic point of view. The object of running, jumping, and other forms of physical exercise, is to bring an increased supply of blood to the muscles in order that they may be nourished and

strengthened thereby, but the effect of cold is to drive the blood out of the muscles into the interior of the body. If the exposure is only momentary, a reaction soon takes place, and the blood comes back to the surface in increased quantity, but if the exposure continues awhile, especially if there is any inactivity, the blood does not come to the surface, and muscles, tendons, ligaments, and joints are likely to be strained and injured. The professional baseball players learned some years ago that early spring practice out-of-doors in a northern climate was very prolific in the cultivation of strained wrists, arms, and shoulders, and consequently now confine their early spring practice to the Southern States.

The preliminary canter which every good runner takes before making a supreme effort even in warm weather, is for the purpose of bringing the blood to the legs and quickening the general circulation. It is advisable, therefore, for all persons who exercise out-of-doors in the winter time, to cover the entire body and limbs with clothing, if they wish to get the best results from their muscular efforts and avoid strains and joint affections.

The present fashion of having the outer garments made large, loose, and free, is an excellent one. No part of the body should ever be so compressed by clothing as to interfere with the performance of any of its functions. Constriction of the waist either by belts or corsets is a bad practice, not only because it may lead to rupture in men and the displacement of the pelvic organs in women,

but because these constrictions interfere with the action of the organs of digestion, circulation, and respiration, which finally leads to disease in these organs, or in some of the parts dependent upon the proper performance of their functions. For the same reasons women's skirts and dresses should be so made that they hang from the hips instead of the waist, and full-length worsted tights should be worn in the winter-time to protect the lower limbs, so that the burden of heavy skirts and petticoats may be dispensed with. The short skirt should also be worn when possible, in order to secure greater cleanliness and freedom of movement.

The high collar is very objectionable hygienically for men, and the high and tight stock is equally objectionable for women. The high collar, by its pressure upon the back of the neck so far above the pivoting fulcrum (the seventh cervical vertebra), brings too constant a strain upon the neck muscles, so that they gradually relax and allow the head to droop forward.

The high and tight stock worn by women interferes with respiration, circulation, and freedom of movement. It also interferes with the development of the muscles of the neck in those who most need it, and covers up those beautiful lines and curves upon the possession of which many women have reason to pride themselves. Moreover, the wearing of stocks, scarfs, comforters, boas, fur tippets, or any kind of a wrap around the neck, tends to make one more susceptible to sore throats and chest

colds. Wraps should only be worn around the neck when one is perspiring freely, or subjected to unusual cold weather.

If you have a good head of hair, the less material worn on the head the better, except when exposed to the direct rays of a hot sun, or to violent wind, rain, or snow-storms. Above all things, do not wear close-fitting, hard-rimmed straw, tall, or derby hats. They interfere with the circulation of blood in the scalp, and frequently cause headaches and premature baldness. A soft felt hat, or a woollen cloth cap, is preferable for fall, winter, and spring, and light, open straw hats for summer. Women's head-gear, from a hygienic point of view, is much more sensible than that worn by men, because it does not cover the head so completely, and allows the hair to have a free circulation of blood and air; consequently there are very few bald-headed women.

A young graduate of West Point was recently asked what he considered the most important thing to do to fit an army for active service. His reply was, "See that every man had a pair of rightly made, properly fitting shoes."

This advice is equally applicable to all persons of both sexes who are engaged in the active affairs of life. The great frequency of corns, bunions, ingrowing toe-nails, weak ankles, and broken down arches, among all classes of our people, are indications in most cases that something is radically wrong with their boots and shoes.

The first requisite of a good shoe is to see that it is adapted to the natural shape of the foot. This implies that the inner side of the shoe shall be nearly straight, and the toe gently rounded instead of being sharply pointed. It also implies that the shoe should not be too large or too small, but comfortable when it is first worn. The sole of the shoe, for ordinary use and for average adults, should be about one-quarter of an inch thick, and the heel about three-quarters of an inch.

If the person is living in the city and walking much on brick, concrete, or flagstone pavements, it is advisable to have at least a quarter-inch of rubber added to the heel. This will prevent constant jarring and concussion, and add to the elasticity of the step. If the ankles are weak, the soles should be made a little broader than the foot, and the heels at least two and a half inches wide and about three inches deep.

If the heels are too high and too small, the ankles are liable to be turned and sprained, and if they are placed too far forward toward the centre of the foot, they tend to take all of the spring out of the arch.

On the other hand, if the foot is made too broad by extending the sole all round, and the heel is made too low and set too far back, the ankle may be weakened by too much support, and the arch of the foot may be broken down by not having support enough. As previously stated, it is better to have the shoe made as near the natural lines of the foot as possible.

As the foot perspires just as the body does, it is very desirable that the vapour thrown off should be allowed to escape; otherwise the feet will be damp and cold. As leather is impervious to air and water, the only way that an escape of the perspiration can take place is out of the top of the boots. For this reason long-legged boots are not in general use at the present time, and the high-top shoes, if tightly laced, are very objectionable. It is much better to wear low shoes when possible in the spring, summer, and fall, and if high shoes are worn, to have them rather loosely laced. Low shoes afford a better opportunity to develop the muscles of the feet and ankles by exercise, and for this reason they should always be worn in practising gymnastics and athletics, except in such games as football, and ice and field hockey, where high shoes may be needed for protection and support.

The use of a special shoe for running, dancing, and nearly every kind of skilled sport, is an indication of the important part which the foot plays in the movements of the body. In my opinion, the feet should be given almost as much care and attention as the hands receive. Children should be allowed to run barefoot during the summer months, when they are at the seaside or in the country, in order that the foot may have a chance to become properly strengthened and developed. The feet should be washed every night and morning in cold water, and be vigorously rubbed with a Turkish towel. The toe-nails should be frequently and carefully cut, and all of the roughnesses

and callous patches should be polished smooth with warm water, soap, and pumice-stone. The stockings worn should be well fitting, that is, neither too large or small, and if the feet perspire freely, cotton should be worn in preference to woollen, even in the winter-time. With reasonable care along the lines which I have indicated, the feet should be kept free from corns, bunions, ingrowing nails, and callosities.

CHAPTER XVIII.

THE VALUE OF REST AND SLEEP

I HAVE written at some length in the preceding chapters upon the value of exercise, but in the daily cycle of life rest and sleep are equally important. The fact that we spend about one-third of our time in bed, and that, however little mental and physical effort we have made through the day, we still feel the need of sleep at night, are simply indications of the organic necessity for frequent periods of absolute rest.

In performing the ordinary functions of life we soon learn that everything that we do is divided into alternate periods of activity and rest. If we have occasion to stand for any length of time, we throw the weight first on one leg, then on the other. So it is with walking, running, skating, and bicycling. All forms of exercise like swimming and rowing, and all forms of labour like mowing, chopping, sawing, hoisting, etc., are reducible to certain rhythms, in which there are periods of alternate activity and rest. This tendency of man to reduce all forms of effort to rhythmic action is simply an attempt to lessen the amount of labour required to accomplish a certain

result. It pervades every kind of human effort, and it grows out of the organic necessities of our being, for the action of the heart, lungs, stomach, brain, and all of their dependencies are to a great extent rhythmic. This must necessarily be so, as no tissue in the body can be kept long in a state of constant tension. For instance, hold the arms out straight for five or ten minutes, and you will find that they will be more fatigued by this continuous effort than they would by two or three hours of alternate effort and rest. This applies not only to the muscles of the arms, but to the muscles and tissues in every part of the body. Continuous mental effort, or emotional strain and excitement, would be equally exhausting.

This tendency to make almost continuous efforts along certain narrow lines of endeavour, whether in school, business, or professional life, is what has made work at the present day so fatiguing, and given rise to so many nervous and mental diseases.

The reason, for the most part, is very clear. When any tissue or organ is kept in a state of activity, a process of disintegration or breaking down into waste products is taking place, which is just the reverse of nutrition, or the process of building up tissue. In other words, when a tissue or organ is doing work, it is expending energy which it has received through the process of nutrition. If the energy put forth in work is equal to the energy received through nutrition, the capacity of the tissue or organ for further effort will be main-

tained. If, on the other hand, the energy expended is in excess of the energy supplied, the tissue or organ will soon be unable to work or become exhausted, and remains in this condition until it is slowly built up again by the process of nutrition. When the activity is continuous, like holding out the arms, the exhaustion takes place much more rapidly. The effect on the brain and central nervous system would not be unlike the effect upon an electric battery used to supply a door-bell, if you kept your finger pressed continuously on the bell button. In one case, the battery cells would become used up, in the other case, certain brain and nerve cells would be exhausted.

Where the fatigue or exhaustion is localized, as in the arm supporting a weight, we may have local restoration of the strength of the arm, due to rest and nutrition. Where the exhaustion is more widely distributed or general, as in case of the accumulated efforts of seeing, listening, thinking, and using many muscles throughout the day, then we are in need of general restoration, which comes through nutrition and sleep.

The chief value, then, of rest and sleep is to curtail the local or general expenditure of energy, and to afford time for local or general nutrition to make good the waste. If the drain is largely a local one, as is likely to be the case in the pursuits and employments of the present day, the best form of rest is some kind of pursuit or recreation that will bring about a change of organic activity.

If one is accustomed to use his brain intently in some sedentary occupation, a very good way of getting rest and refreshment is to engage in some form of physical exercise that will draw the blood into the muscles, and relieve the brain of its congestion. If one engages in an exercise or game, however, that requires great mental activity, and the faculties of attention and alertness are put upon the strain, then the exercise simply adds to the nervous fatigue occasioned by the previous mental pursuit. Even a change in mental employment will afford rest to the wearied faculties, as well as tend to improve the general nutrition of the brain. But it must be a complete change. A person who had been working on mathematical problems through the day could hardly hope to find mental refreshment from playing chess or checkers in the evening. On the other hand, a person who had been reading history or studying languages, unless his attention had been unusually absorbed, might be able to find sufficient change in the games mentioned to find them recreative.

Such games, however, as well as concerts, lectures, theatricals, and musical entertainments, furnish the kind of recreation most needed by the labouring classes, who have been working all day with their muscles, and want more or less mental exhilaration. Many a hard-working man frequents the saloon and takes to drink, certainly not in view of making himself more weary and sluggish than he is, but in hopes of getting, for the time being, into what to him is a more exalted mental condition. So the

delicate society woman, every fibre of whose being is responsive to a supersensitive nervous system, instead of seeking a motor outlet for her pent-up feelings and emotions in some form of physical exercise, finishes up the day at a theatre, symphony concert, or opera, which to her is only another form of dissipation.

It is only another way of playing on the same string, which eventually leads to nervous exhaustion. Monotony either of work or pleasure soon becomes wearisome.

Again I repeat, the best way to get rest is to do something else. Engage in some recreation that brings into action different muscles and faculties from those you have been employing in your regular work. But do not enter into any exercise, sport, or pastime that requires severe mental application, in view of finding rest for either body or brain, as this kind of work is always more or less exhausting to the general nervous system.

When completely run down from overwork or overactivity of any kind, the only way to rest is to cut loose as far as possible from present duties, engagements, and surroundings, and get into a different atmosphere, away from mails, telegraphs, books, and newspapers, where you can literally lie around and do nothing but eat and sleep.

Two or three weeks given up to this sort of life, under favourable hygienic conditions as to diet, pure air, bathing, and sunshine, will accomplish wonders toward a complete restoration of health and vigour.

But for the average man and woman, it is better to

settle the accounts of the day every night; in other words, it is better to make up in sleep at night all of the energy expended in activity during the day previous.

This may be accomplished by most persons in health by spending from eight to nine hours out of the twenty-four in bed. If one can get eight hours of unbroken sleep, he ought to be able to balance his vital accounts daily; but for those working with both body and brain, I think that nine hours' sleep is much more satisfying. Children while growing need more. The following table gives the average duration of sleep required at different ages:

From	4	to	7	years	of	age	12	hours
"	7	"	9	"	"	"	11	"
"	9	"	14	"	"	"	10½	"
"	14	"	17	"	"	"	10	"
"	17	"	21	"	"	"	9½	"
"	21	"	28	"	"	"	9	"
"	28		+	"	"	"	8	"

Sleep being a simple vital process following general fatigue, there ought not, under a natural condition of living, to be any difficulty in attaining it. But as I have intimated in some of the previous chapters, civilized communities are not living under natural conditions, and many persons, after going through the work of the day, are unable to get sound and refreshing sleep. This is especially true of brain-workers. They get by habit a certain amount of brain-rest, but it is not true sleep.

Having done nothing through the day to fatigue the muscles, they are ever on the alert to respond to the slightest motor impulse from the subconscious cerebral centres, and consequently much of the work and worry of the waking life is carried on in dreams. One so troubled twists and turns about in bed, and flexes and extends the limbs as if engaged in active work.

The best remedy for this condition is to give the body and limbs a sufficient amount of physical exercise, throughout the day, to weary the spinal nerve system and lure the higher cerebral centres to rest. This is the kind of sleep that is likely to follow your first long bicycle ride, or your first long tramp in the country, when at the close of the day you throw yourself on to the bed, and enjoy the luxury of letting your body and limbs lie just where they happen to fall — and of finding them in the same place when you wake refreshed in the morning.

This is the kind of sleep which mountaineers, farmers, lumbermen, hunters, and all physically active workers enjoy. It is the refreshment that comes from this kind of sleep that makes some kind of physical training and athletics so valuable to all brain-workers.

As a general rule, the more automatic all mental and physical efforts of the day can be made, the better they serve the purpose as sleep producers. Any undue mental or emotional excitement will occasion wakefulness, while overwork physically may occasion such a profound slumber as to result in that distressed condition termed nightmare.

In this case, the will and the higher cerebral centres may be cognizant of the perilous condition portrayed in the dream, but they are impotent to move body or limbs to get away from the supposed danger because the automatic subconsciousness is suspended, and the motor system, with its nerves of action, sleeps.

Sometimes distressing dreams and more serious results may be occasioned by indigestion. This is especially likely to occur if the stomach and visceral organs have been overworked, and the brain and body have been much fatigued by the day's efforts. A case like this not infrequently happens. A person past middle life is found dead in bed. Upon inquiry into the probable cause, no one knows, but some member of the family usually volunteers the information that father or mother, whoever the unfortunate one may be, went to bed unusually well, having done a hard day's work, and eaten a very hearty supper or dinner just before retiring. The inertness or cessation of functional activity on the part of the digestive organs, when they have been much overworked, has led some physiologist to claim that there is such a thing as visceral sleep. We certainly know that the digestive organs must have rest sometime, and it is perfectly natural for it to occur when other parts are comparatively inactive. We also know from the number of deaths that have resulted, that it is an extremely hazardous thing to eat a very hearty meal just before retiring, after an unusually hard day's work, especially

if accompanied by great nervous strain and emotional excitement.

In considering the troubles of sleeplessness, therefore, it is well to inquire whether they have their origin in the brain, muscles, automatic centres, or digestive organs. The most sound and refreshing sleep occurs where all of these parts have their proportionate amount of daily work to do, where no part is overworked, and where each part assists the work of every other. This, in short, is a condition of perfect health, and perfect sleeping is a function which only a sound mind in a sound body can healthily perform.

There are a number of general observations in regard to sleep which may be summarized as follows:

As far as possible, cultivate the habits of retiring, sleeping, and rising at regular hours.

An unusual amount of mental or physical work should be followed by an increased amount of sleep. The reason that many persons cannot get sound sleep is because they have never earned it. They have not made mental or physical effort enough to make them tired.

Do not seek sleep as a relief for pain, trouble, or distress of any kind. Find relief if possible before resorting to sleep. "Put off thy cares with thy clothes."

Do not sleep in a cold, damp room. The sheets should be warm enough to cause the skin to relax, not to contract.

Have clothes enough on the bed to make the body

comfortable, but not too warm. As a rule, each person should occupy a separate room, or at least a separate bed. Do not sleep in a room containing plants, or where there are odours or sounds. Do not overload the stomach at night, or go to bed hungry. Eating a cracker or drinking a glass of milk may be inducive to loss of consciousness, but as a general rule sound, refreshing sleep cannot be obtained when the digestive organs are busy with food.

Do not sleep with the arms stretched above the head; it is better to have the limbs relaxed, and to lie upon the right side. This position of the body favours the passage of the food from the stomach to the intestines, and thus aids digestion.

As far as possible, however, cultivate the habit of sleeping independently of circumstances. If you have trouble in getting to sleep, ascertain the cause. A condition of weariness is favourable to sleep, therefore make yourself comfortably tired by some mild form of physical exercise before retiring. Sometimes a warm bath or rubbing the skin all over with a rough Turkish towel will induce sleep. Avoid sleeping in the daytime, and do not lie down during the evening. If you have difficulty in getting to sleep one night, do not go to bed early the next night in expectation of making up your lost sleep. In this way one often cultivates the habit of wakefulness.

Retiring late for two or three successive nights and rising at the usual hour will tend to break up the habit

of wakefulness. If in the habit of waking very early in the morning, darken the bedroom, or put a black bandage over the eyes.

Persons who are in the habit of doing brain-work should dismiss all thoughts of study, business, or pleasure before retiring, and discipline themselves to mental quietude and composure. Those who are accustomed to much reading, writing, or speaking, or to a fine grade of detailed muscle-work requiring close attention, and those who have to cultivate a habit of readiness and expectancy as to orders, signals, etc., should arrange their sleeping accommodations so that they can secure the utmost freedom from sounds or impressions of any kind that will arouse their expectant attention.

If necessary to rise early, it is better to depend upon an alarm-clock or upon being called, than to go to bed with the mind charged with a half-cocked readiness to awake at a certain hour.

Those who are engaged in employments that bring into action the larger groups of muscles, do not have to concern themselves much about sleep. If not too tired or muscle-lame from overexertion, they can usually sleep most anywhere. The chief essentials are a comfortable bed, and an opportunity to stretch the limbs and relax the muscles.

"It is a delicious moment, certainly, that of being well nestled in bed, and feeling that you shall drop gently to sleep. The good is to come, not past; the limbs have

just been tired enough to render the remaining in one posture delightful; the labour of the day is gone. A gentle failure of the perceptions creeps over you, the spirit of consciousness disengages itself once more, and with slow and hushing degrees, like a mother detaching her hand from that of a sleeping child, the mind seems to have a balmy lid closing over it, like the eye, — it is closed — the mysterious spirit has gone to take its airy rounds." (Leigh Hunt.)

CHAPTER XIX.

HOME ATHLETICS

MANY of the exercises which I have selected for home use have been taken directly from the athletic field, where the different positions and movements in running, putting the shot, throwing the hammer, etc., may be witnessed daily. Other exercises have been suggested by different forms of labour, now almost obsolete in many communities, such as chopping wood, hoisting sail, pitching hay, mowing, etc. Still others have been suggested by different sports and games, such as rowing, fencing, swimming, diving, and the long pass in football, and the long drive in golf. Some exercises have been named on account of their fancied resemblance to the movements of the walking-beams of steamboats, the driving-wheels of locomotives, and the brakes of hand fire-engines. In many instances, for the want of a better name, the parts of the body affected, or the positions taken, or the action required, have served to designate the exercise. In every case it has been thought best to have a name instead of a number by which the exercise might be known and described.

The exercises selected cover a wide range of movements, and are so varied as to be readily adapted to the special needs of men, women, and children of all ages. In fact, there is hardly an exercise given that may not be performed with safety by any one in health, though some are much more difficult than others. The exercises which are especially adapted to the two sexes, at different ages, have already been mentioned in the chapters devoted to children, young men, women, etc.

The aim throughout has been to select such exercises as call for a gentle strain on many muscles, rather than a great strain on any one. Especially stress has been placed upon the selection of such exercises as develop the great trunk and fundamental groups of muscles, rather than the accessory groups that manipulate the feet, hands, and fingers.

The efficiency of an exercise depends upon the amount of action in it, and this depends upon the speed and intensity with which it is done or upon the range of movement.

The natural resistance required in all effective exercises is obtained in the following selection by throwing the weight of the body on to the legs, which are placed in a more or less flexed or extended position, bending the trunk of the body as far from the centre as possible, and adding to the strain by extending the arms or legs, and by suddenly changing the direction of the movements of the arms, legs, or trunk, overcoming inertia and thereby adding

momentum to their weight. By concentrating the attention on each exercise, entering into the spirit of it and energizing the movement at the proper time, excellent results may be accomplished. Each exercise should follow a certain rhythm, and at a certain speed. A minimal, medium, and maximal rate is given for each exercise, but each individual will have to determine by practice the rate and rhythm that are best adapted for his height, weight, length of limbs, etc.

CHAPTER XX.

PRACTICAL SUGGESTIONS IN REGARD TO EXERCISES

In order to realize the best results from physical exercise, enter with earnestness and enthusiasm into whatever you undertake. Half-hearted efforts are usually followed by half-hearted results. While choosing a place for exercise, bear in mind that the chief requisites are plenty of sunlight and fresh air.

If you have been inactive for a long time, begin to exercise gently, doing but a few movements the first day, and gradually increasing the time and amount of effort as you grow stronger and more enduring. Never continue your exercise to exhaustion, and always end as gradually as you begin. Do not keep the muscles on the stretch or under prolonged contraction, as frequently required in maintaining strained positions. Relaxation should always follow contraction, or, in other words, rest should follow exercise. The best way to secure local rest is to use the muscles of some other part of the body.

Exercise daily and at regular times, if possible; by so doing you will acquire the habit of exercise and your

system will unconsciously nerve itself up to the effort expected of it. Do not exercise within two hours after eating or one half-hour before.

After pursuing the same kind of exercises for six or eight weeks, the system acquires a tolerance for them, as it were; that is, it ceases to respond to their developing influences. At this time better results may be attained by trying a change of movements or exercises.

The best physical and mental results may be attained from exercise, when circumstances permit of it, between ten and twelve o'clock in the forenoon, and the next best results between four and six in the afternoon. Where these hours are not convenient, very good results may be attained by exercising in the morning before breakfast, or the last thing at night, just before going to bed. If a person, however, for any reason does not sleep well, and awakes feeling tired in the morning, exercise before breakfast is not advisable, except perhaps a few minutes' walk in the open air. It is much better for such a person to exercise at night, not violently, but gently and persistently for fifteen or twenty minutes, in view of getting the excess of blood out of the head, and inducing a good night's sleep. For most persons I think that the hour before breakfast is a preferable one for home exercises. At this time they may be taken without the restrictions of clothing, in the fresh morning air, followed by the tonic effect of a cold sponge bath.

If there is any weakness of the heart, avoid the cold

bath, and exercise slowly and deliberately, taking frequent intervals of rest. If the heart is strong, exercise vigorously and persistently enough to quicken the breathing and start the perspiration before you finish.

If you are undergoing a great mental strain, as during periods of school examinations, or in attending to an unusual amount of mental work, do not increase the amount of physical exercise at this time, but rather diminish it until after the mental strain is over. If, on the other hand, one is subjected to unusual mental or emotional excitement, it is better to increase the time and amount of exercise, using chiefly the muscles of the legs and lower trunk.

The mind exerts a powerful influence upon the tone and contractile energy of the muscles. Where it is desired to produce the best results upon the physique from a muscular or developmental point of view, give your whole attention to the exercise in which you are engaged. Execute every movement with accuracy and precision. Be conscious of the muscles you are using, and become, for the time being, a devoted admirer of your own physique.[1] If exercising before a looking-glass will help you concentrate your attention upon the contraction of muscles, use a looking-glass. Learn to cultivate a consciousness of the muscles that help you maintain the

[1] This theory, which is claimed to be original with some instructors, who have recently put it in practice, was published in my "Handbook of Developing Exercises," in 1881.

upright position, so that you will readily recognize them when you want them to do duty.

In order to offset the restricting and hampering effect of devoting too much attention to the muscles, after you are able to contract and relax them as you will, it is best for you to practise those exercises that require you to concentrate all your energy and attention upon the *thing to be done,* rather than upon the muscles that are engaged in doing it. Cultivate the power of relaxing instead of contracting antagonistic muscles. This is the athletic in distinction from the developmental point of view, but it leads to the more efficient working of the muscles.

All exercises must be performed with sufficient vigour and rapidity to engage the energetic contraction of the muscles employed. When this is done, old tissue is broken down, and its place is supplied with new material in increased quantity, thus augmenting the size and strength of the muscles. The brain gains the power and energy which the exercise requires it to put forth.

Try to secure a harmonious development of the whole body. One-sided development is usually attained by robbing some other part of its just share of the nutriment.

Most persons, in their daily occupations, use the flexor muscles more than the extensors, thereby cramping the vital organs and interfering with their functions. For this reason most of the free exercises introduced in this

book are designed to act upon the back, chest, and side and front walls of the abdominal cavity.

A sufficient number of muscles should be called into action at one time to stimulate the action of the heart and lungs, and increase the circulation and respiration. This is one of the most important considerations to bear in mind in regard to exercise, for in such general activity all parts of the body are improved by your physical efforts.

Exercises

Exercise 1

ADORATION

Position — Stand with feet and hands together, as shown in Fig. 1.

Movement — Throw the hands and forearms backward until they assume the position shown in Fig. 2, with the elbows shoulder high and the palms forward. Return to the first position, and repeat the movement.

Times — 20 — 40 — 80. Rate per minute, 20 — 40 — 60.

Caution — In doing this exercise, see that stress is placed upon throwing the hands backward, instead of the elbows. Do not throw the arms violently backward, as it causes an undue prominence of the collar-bones where they join the breast-bone.

Parts Affected — Principally the muscles between the shoulder-blades that tend to hold the shoulders back.

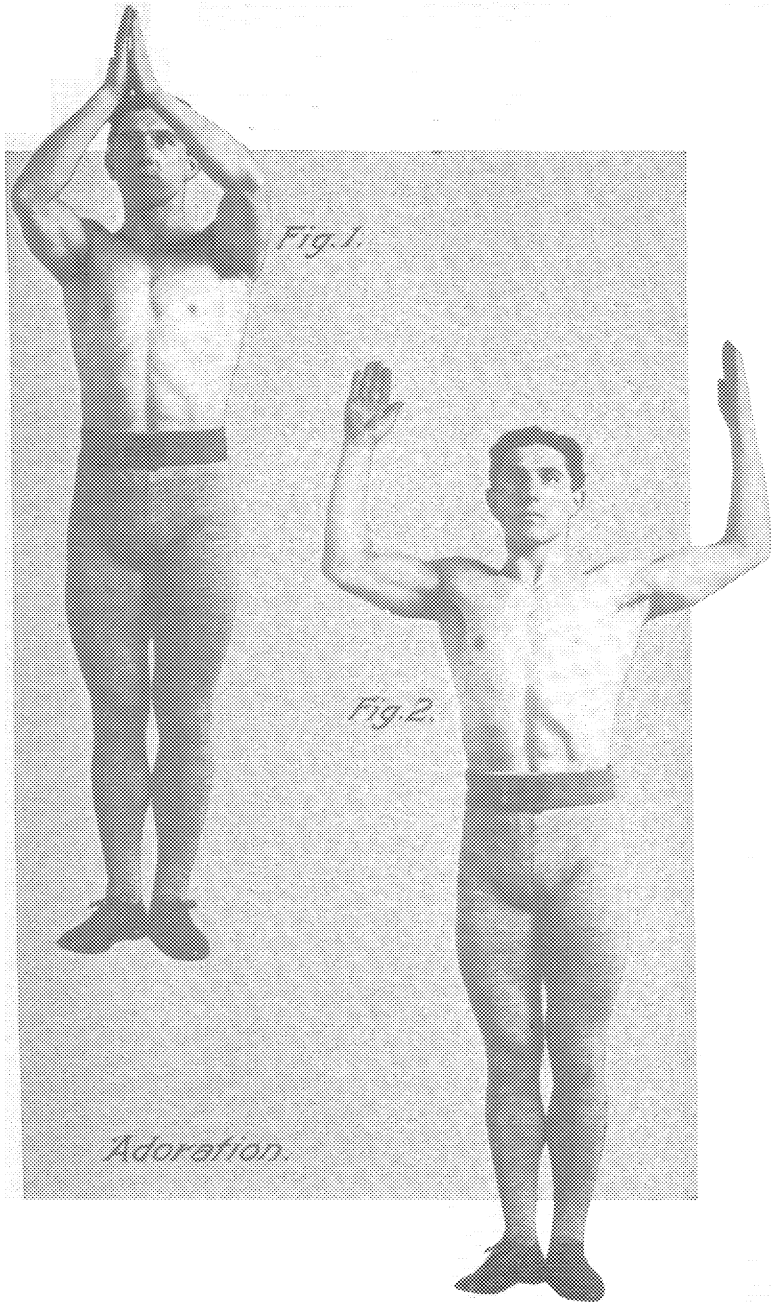


Fig. 1.
Fig. 2.
Adoration.

Exercise 2

TREE SWAYING

Position — Stand with feet together and the arms extended above the head.

Movement — Lean over to the left, as shown in Fig. 3. Sway back again to the right, as shown in Fig. 4. Repeat the exercise.

Times — 10 — 30 — 60. Rate per minute, 30 — 40 — 50. Counting each movement.

Caution — In this exercise do not keep the hands and arms rigidly straight above the head, as this might strain the muscles on the lower sides of the abdomen. It is better to relax the hands and arms somewhat, as shown in the illustrations.

Parts Affected — Alternately the muscles on the right and left sides of the abdomen and lower back. An excellent exercise to help reduce the width of the waist in case of corpulency.

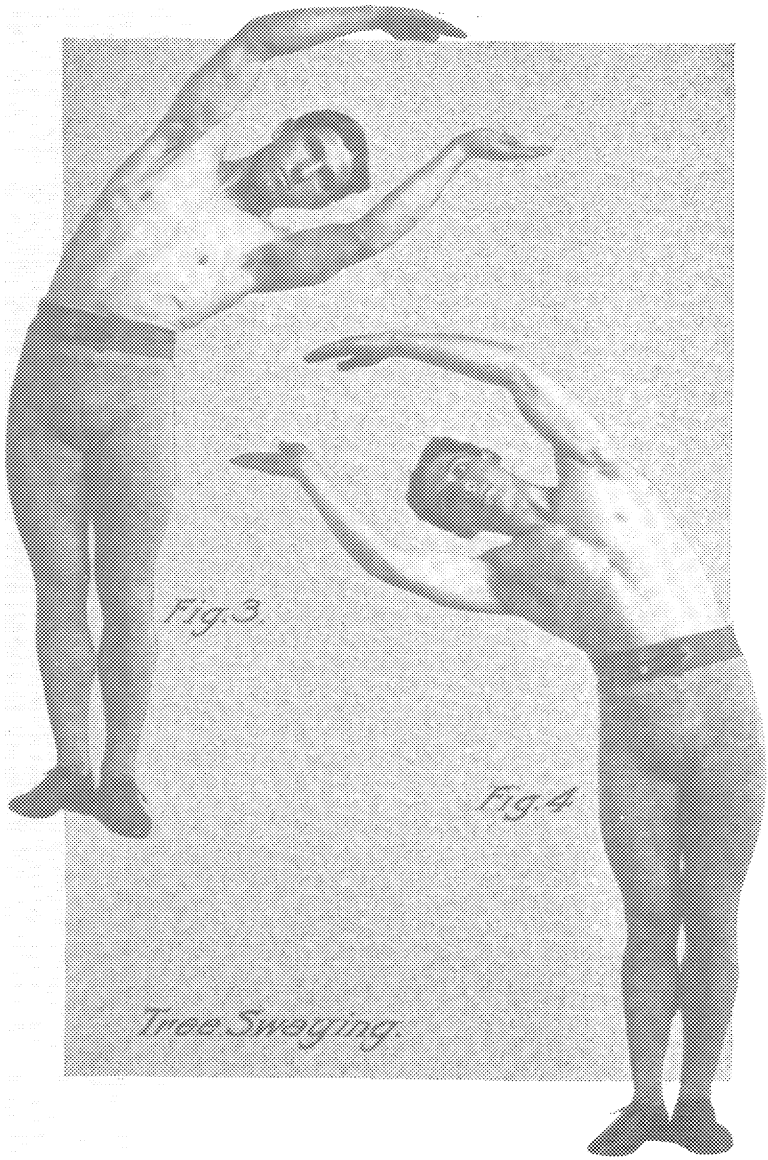


Fig. 3
Fig. 4
Free Swaying.

Exercise 3

ARCHERY

Position — Stand facing to the left with feet about eighteen inches apart and arms extended, as shown in Fig. 5.

Movement — While holding the left arm extended, pull the right hand and arm backward as far as possible, as though shooting with a bow, to the position shown in Fig. 6. Face to the right and execute a similar movement by bringing the left arm backward while the right is held extended. Repeat.

Times — 20 — 40 — 60. Rate per minute, 10 — 24 — 40.

Caution— In doing this exercise, lay particular stress upon the arm that is pulling the "bowstring," throwing the head backward and the chest well outward with each retraction of the arm.

Parts Affected — Broad superficial muscles of the right and left sides of the back, muscles between the shoulder-blades, and those of the upper arms and shoulders. An excellent exercise for expanding the chest.

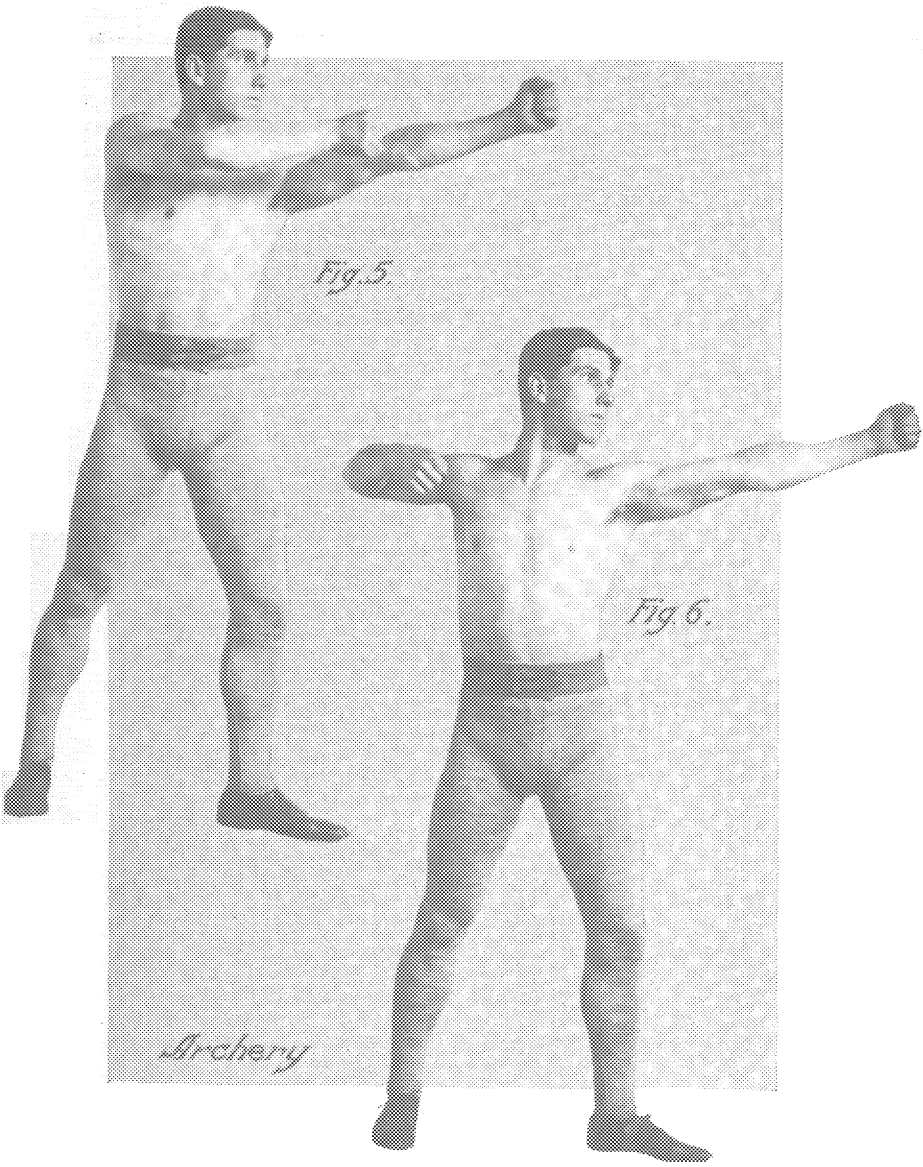


Fig. 5.

Fig. 6.

Archery

Exercise 4

WOOD-CHOPPING

Position — Stand with the feet about eighteen inches apart and the hands clasped together over the right shoulder, as shown in Fig. 7.

Movement — Swing the arms downward between the legs as indicated in Fig. 8. Now return to a similar position with the hands thrown over the left shoulder. Repeat, alternating right and left.

Times — 10 — 30 — 60. Rate per minute, 15 — 25 — 35.

Caution — In executing this movement, do not swing the arms too far out from the sides, or plunge the head too violently downward, but twist the body to the right or left with every upward movement.

Parts Affected — Principally muscles of the lower back, right and left abdominal walls, and upper arms and shoulders.

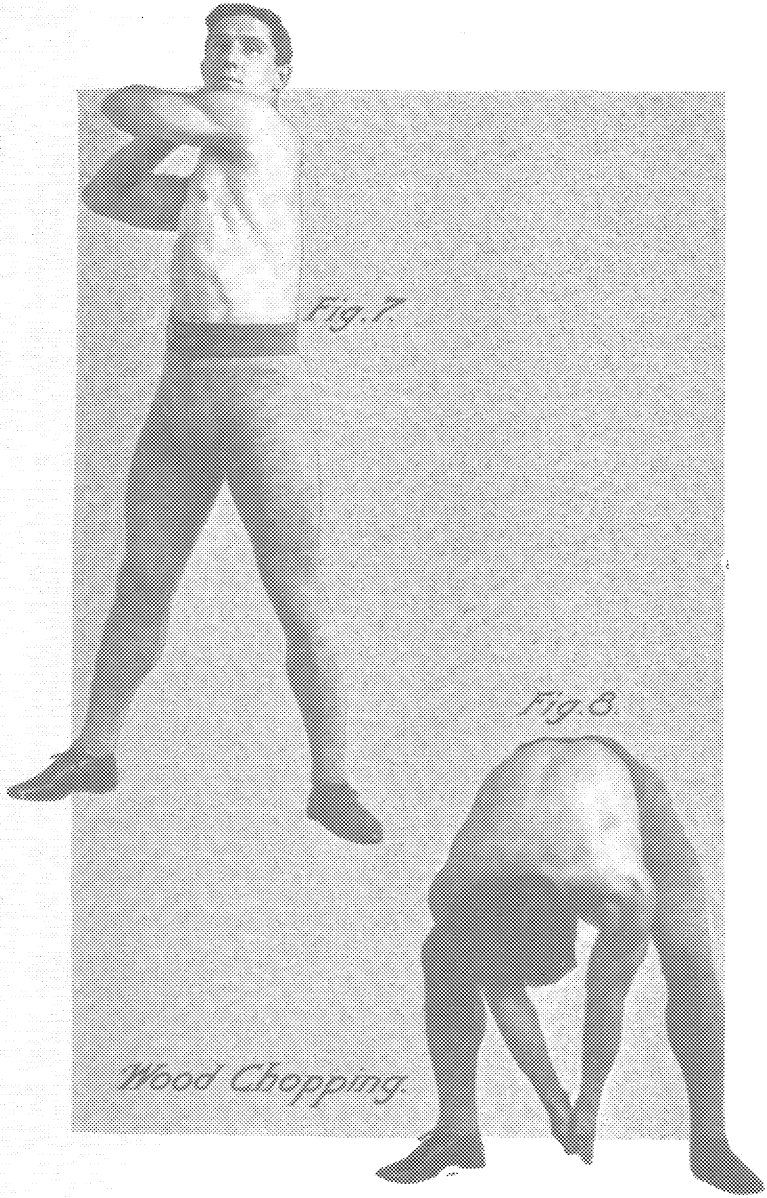


Fig. 7.
Fig. 8.
Wood Chopping.

Exercise 5

PUTTING THE SHOT

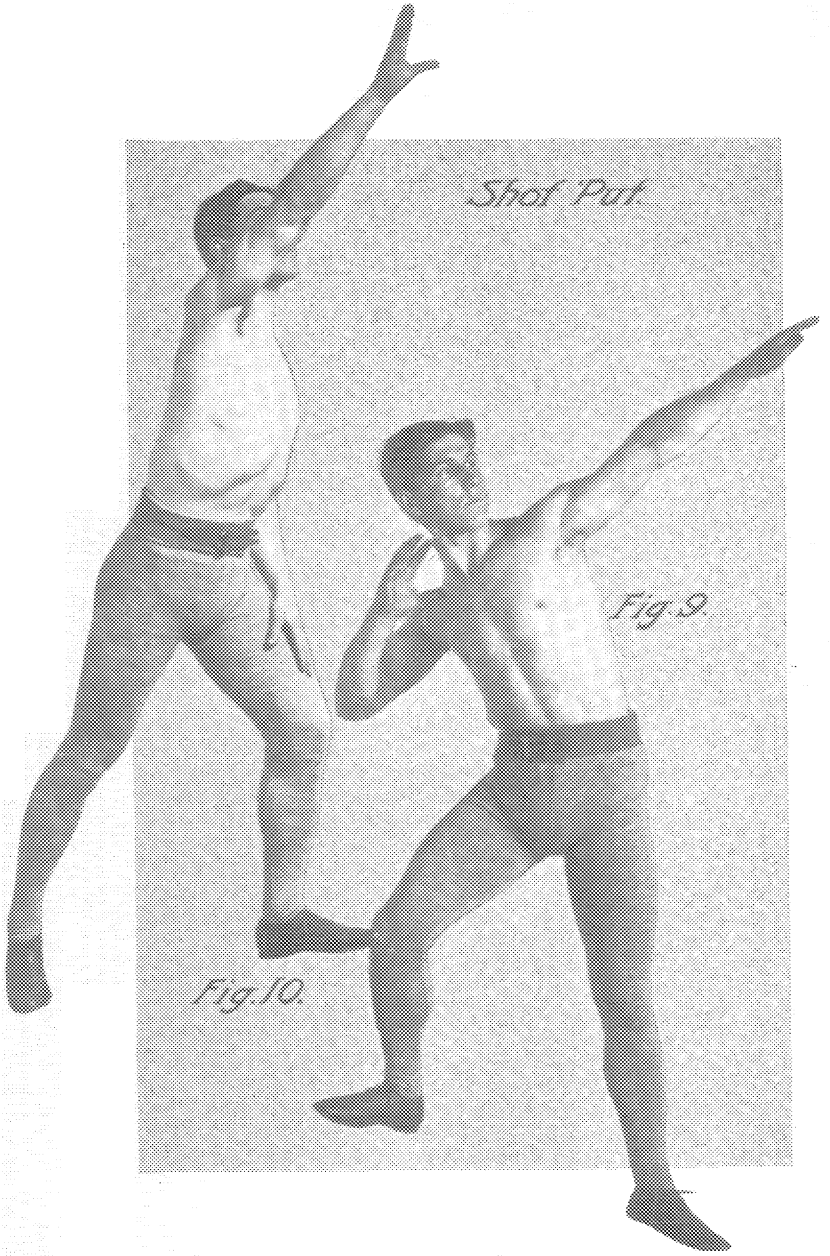
Position — Stand with the feet about twenty-four inches apart, the weight of the body thrown back on to the right leg, and the right arm drawn back as though about to "put the shot." See Fig. 9.

Movement — Shoot the right arm vigorously forward, spring from the right leg, and extend the body forward simultaneously to the position shown in Fig. 10. Return to the starting position and repeat the exercise. Try the same movement with the left arm and leg.

Times — 10 — 30 — 60. Rate per minute, 15 — 20 — 30.

Caution — In executing this movement, put as much energy as possible into the extension of the leg, arm, and body, but be sure and keep both feet on the floor. In order to do this the hand which is not "putting the shot" should be brought down on to the advanced leg each time for support.

Parts Affected — Extensor muscles on the front of both thighs, calves of the legs, chest, extensors of both arms, sides of abdomen, back, and waist.


Shot Put.
Fig.9.
Fig.10.

Exercise 6

SWIMMING (BREAST STROKE)

Position — Stand with the feet about twenty-four inches apart, the left foot advanced, the weight thrown back on to the right leg, and the arms bent at right angles ready for the beginning of the stroke, as shown in Fig. 11.

Movement — Shoot the arms directly forward, incline the body forward, straighten the right leg, and throw the weight on to left leg, which should be bent at the knee, as shown in Fig. 12. Now sweep the hands and arms around outward and backward in a horizontal plane until arms, trunk, and legs are brought back to the starting-position as described above. Repeat, reversing frequently the position of the front and rear legs.

Times — 10 — 30 — 60. Rate per minute, 25 — 30 — 35 — 40.

Caution — In taking this exercise the arms, body, and legs should work simultaneously. Special stress should be put upon the alternate extension and flextion of the front and rear legs, and the inclination of the body forward and backward with each stroke.

Parts Affected — Muscles of the arms, shoulders, chest, and upper back, but especially the extensor muscles of the thighs and back, and the muscles of the abdomen.

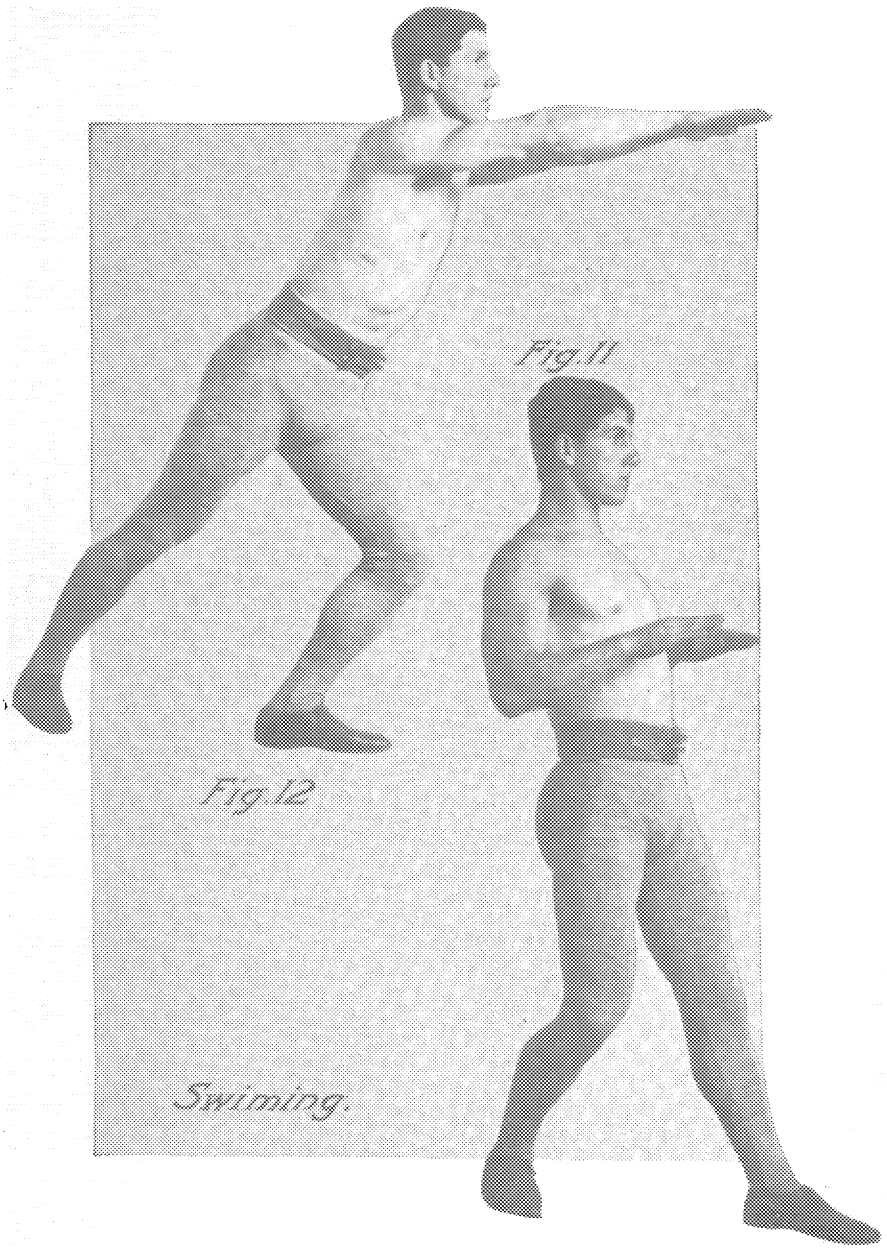


Fig. 11

Fig. 12

Swimming.

Exercise 7

DIVING

Position — Stand with the feet together, and the hands with palms pressed together, while the arms are extended above the head. See Fig. 13.

Movement — Extend the right leg backward, and bend the left knee, and dive with the head and arms downward until the fingers touch the floor, as shown in Fig. 14. Return slowly to first position, and repeat the exercise, bending the right knee and carrying the left leg backward.

Times — 5 — 10 — 20. Rate per minute, 10 — 16 — 20.

Caution — In this exercise put the greatest stress upon the extension of the leg backward so as to maintain a balance.

Parts Affected — The extensor muscles on the front of the thigh in the leg sustaining the weight. The muscles on the back of the hips, thigh, and calf in the leg extended backward, and the muscles that erect the spine and extend the arms. The flexors of the fingers and the muscles of the upper back and anterior of the shoulders are used in bringing the arms to a position above the head.

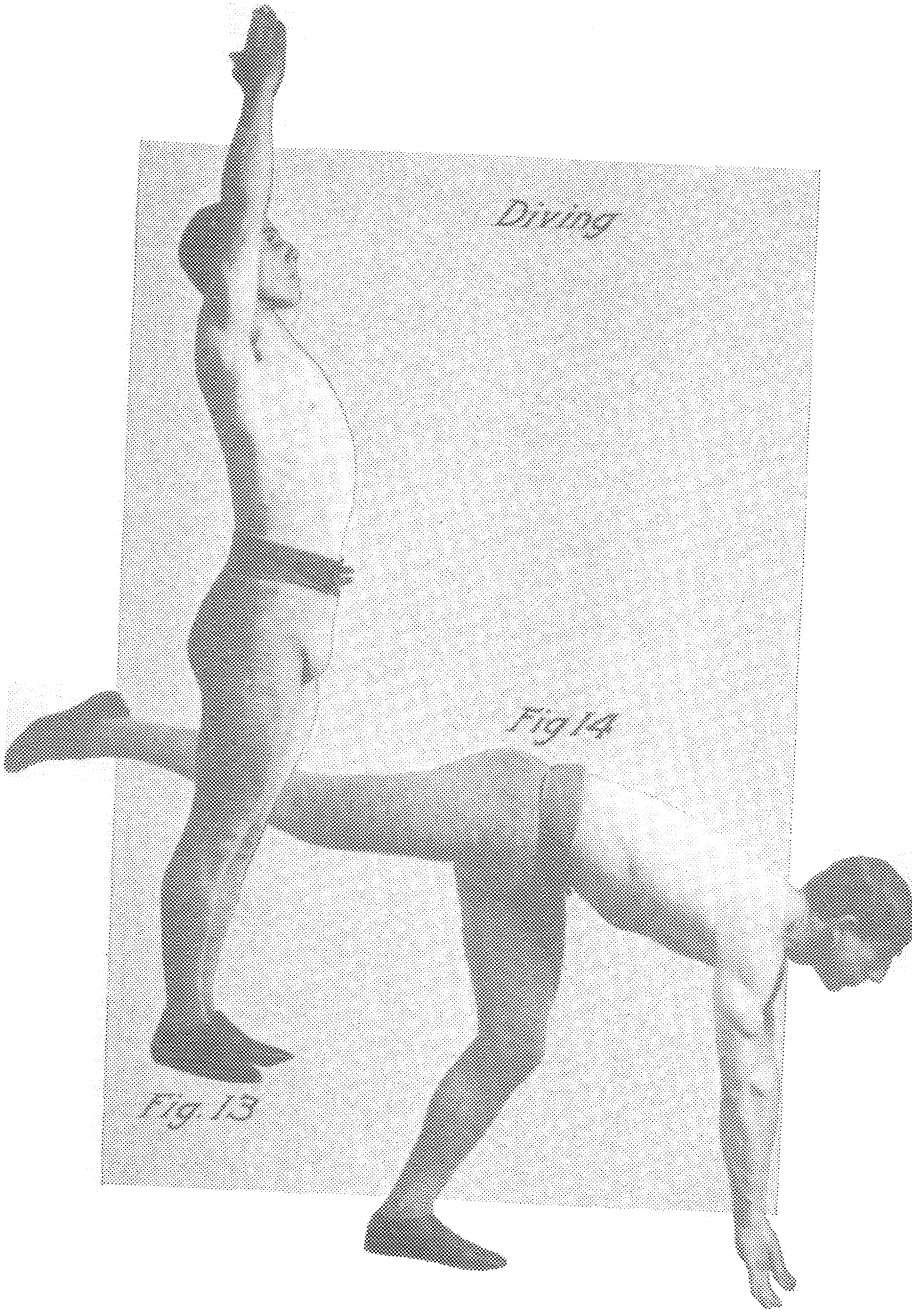


Fig 13

Fig 14

Exercise 8

STRIKING THE ANVIL

Position — Stand with the feet twenty-four inches apart, arms extended in a horizontal position sideways, and head turned to the left, as shown in Fig. 15.

Movement — While keeping both arms rigidly straight, swing the right hand over the head and bring it down on to the left hand with a slap, as shown in Fig. 16, then continue the circular movement downward with the right arm and hand until they are brought around to the first position. (See Fig. 15.) Repeat the exercise, and then hold the right arm and hand extended, and swing around on to them with the left.

Times — 10 — 20 — 30. Rate per minute, 12 — 24 — 36.

Caution — This exercise may be improved considerably in its all-round effects by throwing the weight on to the advanced leg in striking the blow and then swaying back on to the rear leg as the striking arm returns to the first position.

Parts Affected — Shoulders, chest, broad muscles of the back, and oblique muscles of the abdomen. When the swaying movement is taken, the legs also come in for a share of the benefit.

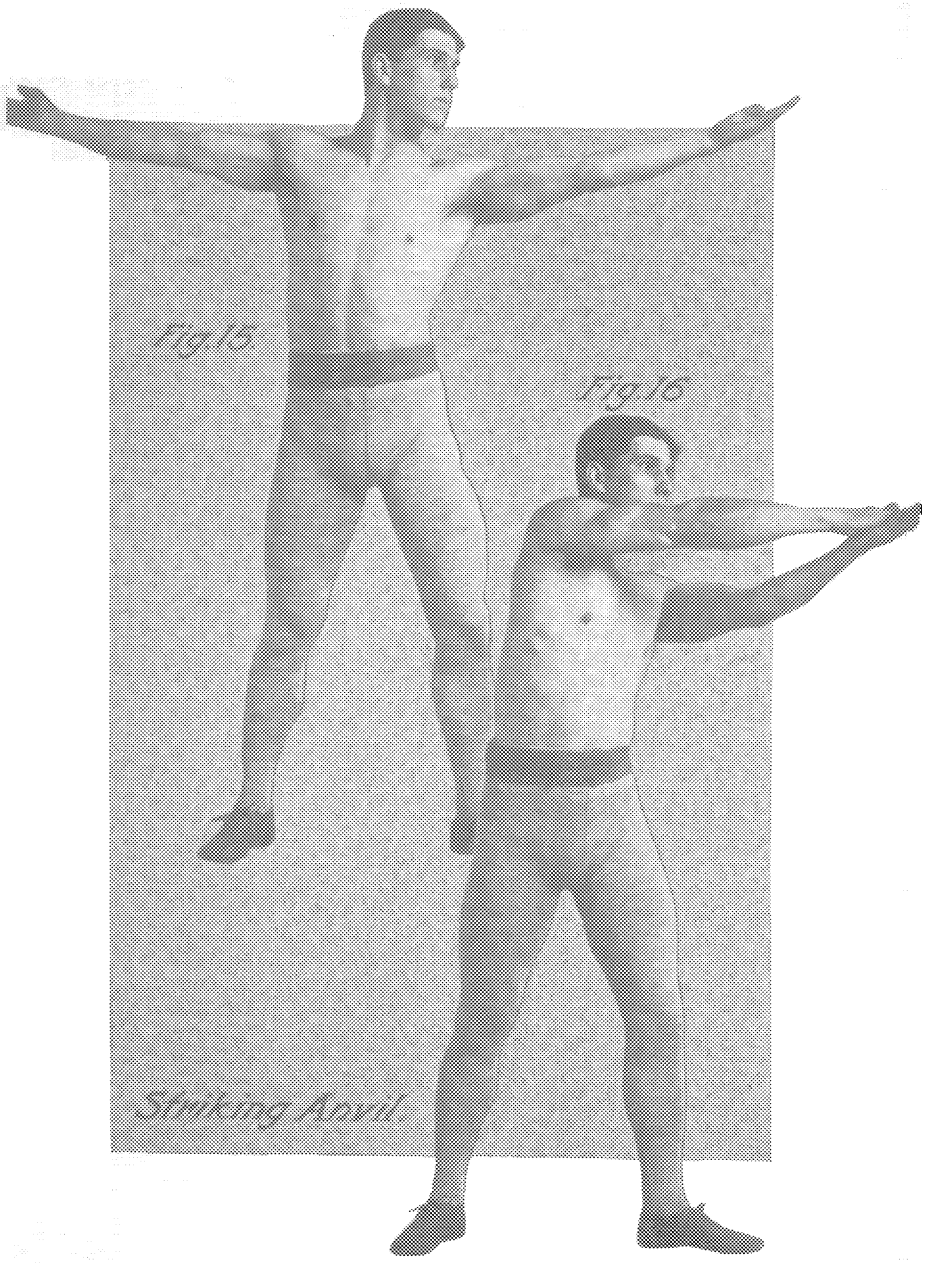


Fig.15.
Fig.16
Striking Anvil.

Exercise 9

SCOOPING SAND

Position — Stand with the feet about eighteen inches apart, and both hands held above the head, as in Fig. 17.

Movement — Swing the arms slightly outward and downward, bending the body and knees at the same time until the backs of the hands touch the floor, as shown in Fig. 18. From this squatting position arise energetically by straightening the back and legs, and raising the arms above the head until they are in the first position. Repeat.

Times — 5 — 10 — 20. Rate per minute, 10 — 20 — 30.

Caution — Energize the upward movement, lifting the hands directly upward as though they were filled with sand that you were trying to lift as high as possible.

Parts Affected — Anterior and middle part of shoulders, upper chest, upper and lower back, extensor muscles on the front of the thighs, calves, and upper arms.

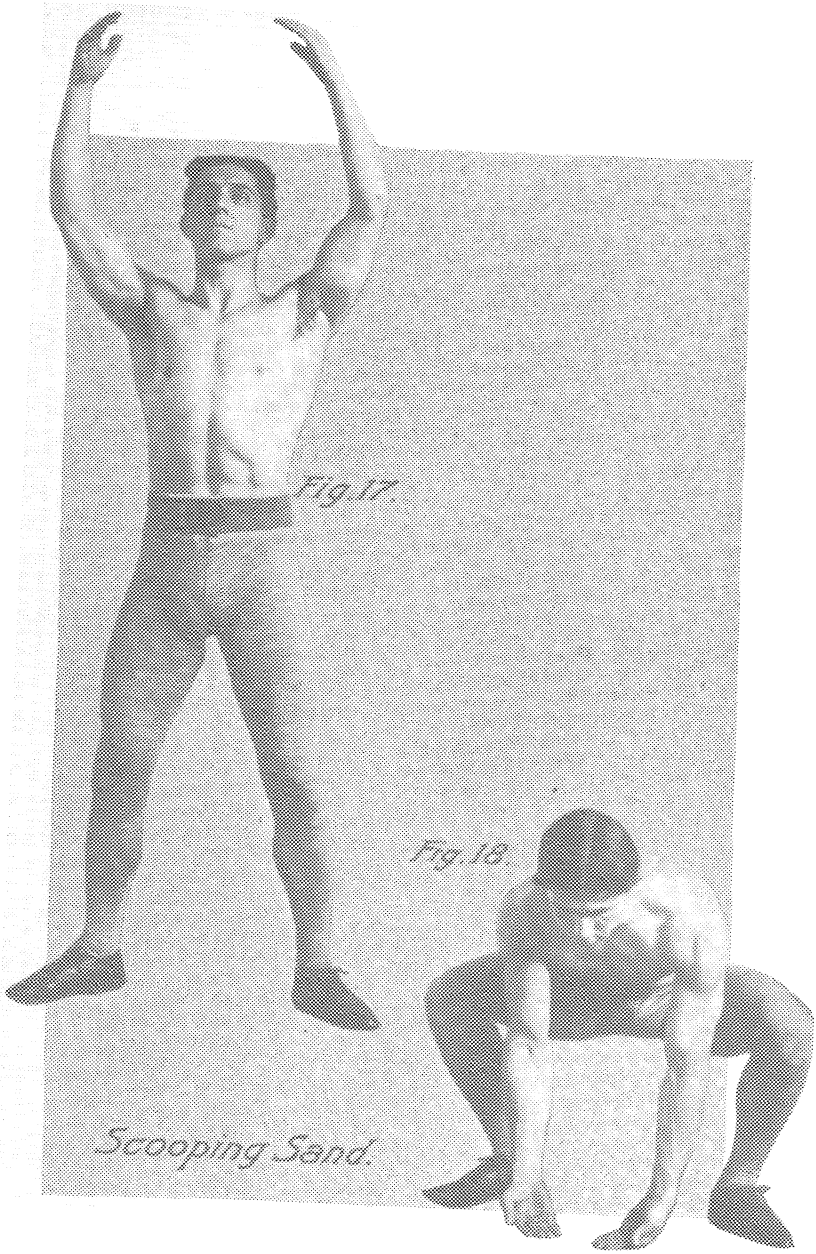


Fig 17.
Fig 18.
Scooping Sand.

Exercise 10

ROPE PULLING

Position — Stand with the feet about twenty-four inches apart, the arms extended well out from the left side of the body, and the weight resting mostly on the left leg See Fig. 19.

Movement — Clinch the hands as though grasping a rope, and sway over to the right side, at the same time straightening the left leg, bending the right knee, and pulling the hands into a position in front of the waist. See Fig. 20. Now extend the arms forward again, throw the weight on to the left leg, and repeat the exercise. Try the same movement from the other side with the right leg advanced.

Times — 20 — 40 — 80. Rate per minute, 10 — 20 — 30.

Caution — Extend the arms well out from the side, bending the back to increase the reach, and sway back and forth with perfect regularity.

Parts Affected — Adductors of the thighs, calves, and extensors of the legs, broad muscles of the back, chest, waist, and flexors and extensors of the arms.

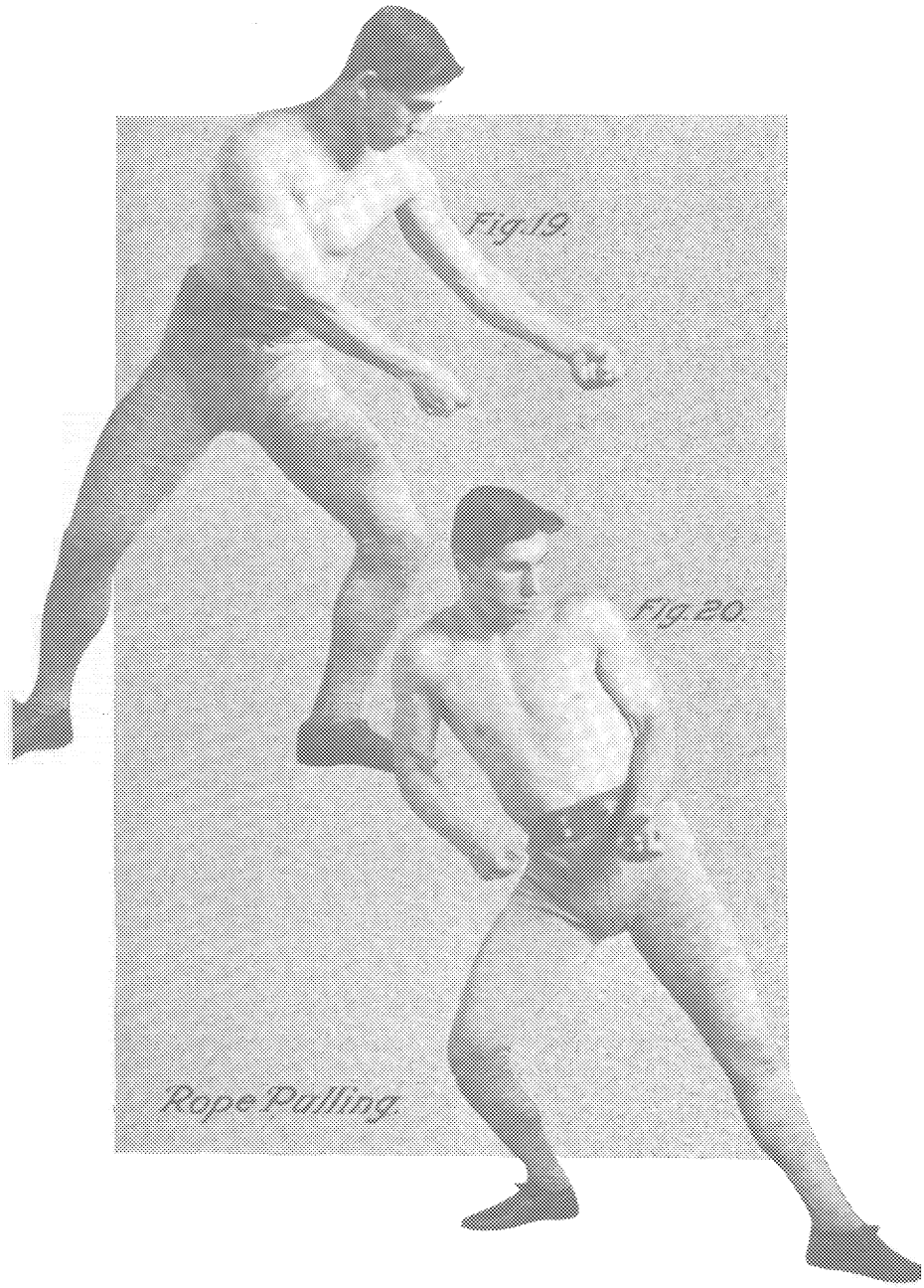


Fig.19
Fig.20
Rope Pulling

Exercise 11

TEAMSTERS' WARMING

Position — Stand with the left leg crossed over the right, and both arms extended horizontally outward, as shown in Fig. 21.

Movement — Jump from the first position to the stride standing position, with arms folded about the chest, as shown in Fig. 22, then jump back to the first position with right leg crossed in front of the left. Continue the exercise, alternating with the right and left legs in front, and the right and left arms over.

Times — 20 — 40 — 80. Rate per minute, 16 — 32 — 48.

Caution — This exercise may be varied by crossing the arms at the same time the legs are crossed, and extending the arms the same time the legs are thrown apart.

Parts Affected — The muscles on the inner side, outer side, and front of the thighs, the calves, shoulders, chest, arms, and muscles of the upper part of the back.

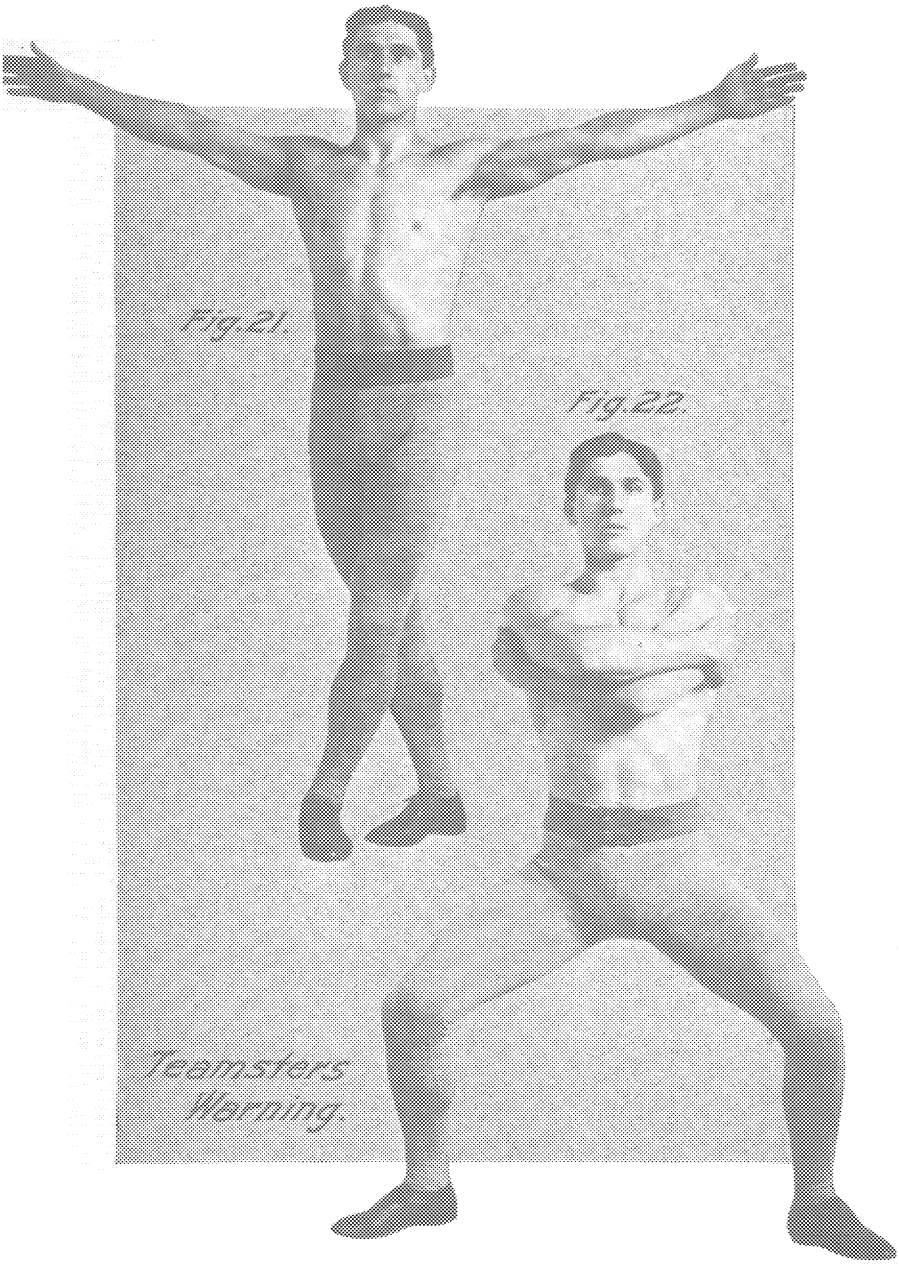


Fig.21.
Fig.22.
Teamsters
Warning.

Exercise 12

FENCING

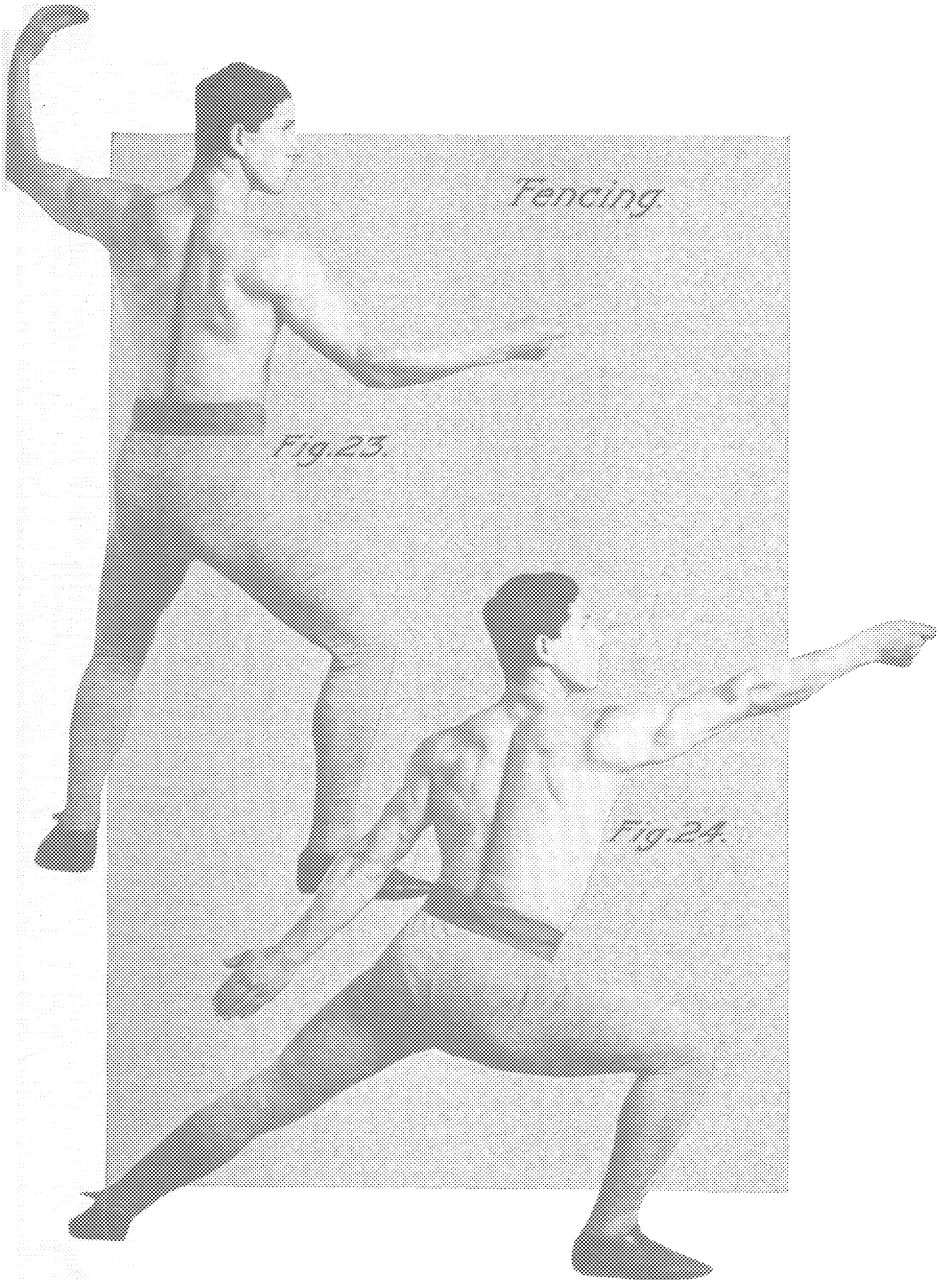
Position — Stand facing to the right, with the feet about eighteen inches apart, both legs bent at the knee, right arm held at a right angle in front of the body, and left arm held at about the same angle back of the head, as shown in Fig. 23.

Movement — Lunge forward with the right foot thirty-six to forty inches, straightening the left leg, and at the same time extending the right arm forward and the left arm downward, as shown in Fig. 24. Spring back to the first position by straightening the right leg and retracting the arms, and repeat the exercise. Reverse the position, and advance with the left leg.

Times — 15 — 25 — 50. Rate per minute, 12 — 24 — 36.

Caution — In making the lunge forward and the spring backward to position, see that the rear leg is kept absolutely straight, with the heel on the floor, and that the arms and legs work in unison.

Parts Affected — The extensors of the legs and the abductors on the inner side of the thighs are the principal muscles brought into action, though the extensors and flexors of the arms, and the muscles of the shoulders, upper back, and chest have considerable to do.


Fencing.
Fig.23.
Fig.24.

Exercise 13

PADDLING CANOE

Position — Stand with feet together, both arms extended downward to the left side as though in the act of paddling a canoe. See Fig. 25.

Movement — While keeping the arms and hands about twelve inches apart, sweep them downward, backward, and upward to the left, until the left hand comes uppermost and above the left shoulder, then sweep the arms downward, backward, and upward to the right, turning the body in the same direction, as shown in Fig. 26. Repeat the movement, alternating from side to side.

Times — 10 — 20 — 50. Rate per minute, 16 — 32 — 48.

Caution — Be sure and keep the right arm uppermost in paddling to the left, and the left arm uppermost in paddling to the right. Bend the body forward and to the side with each downward stroke.

Parts Affected — The chest, shoulders, arms, upper and lower back, oblique muscles of the abdomen, and sides of the waist.

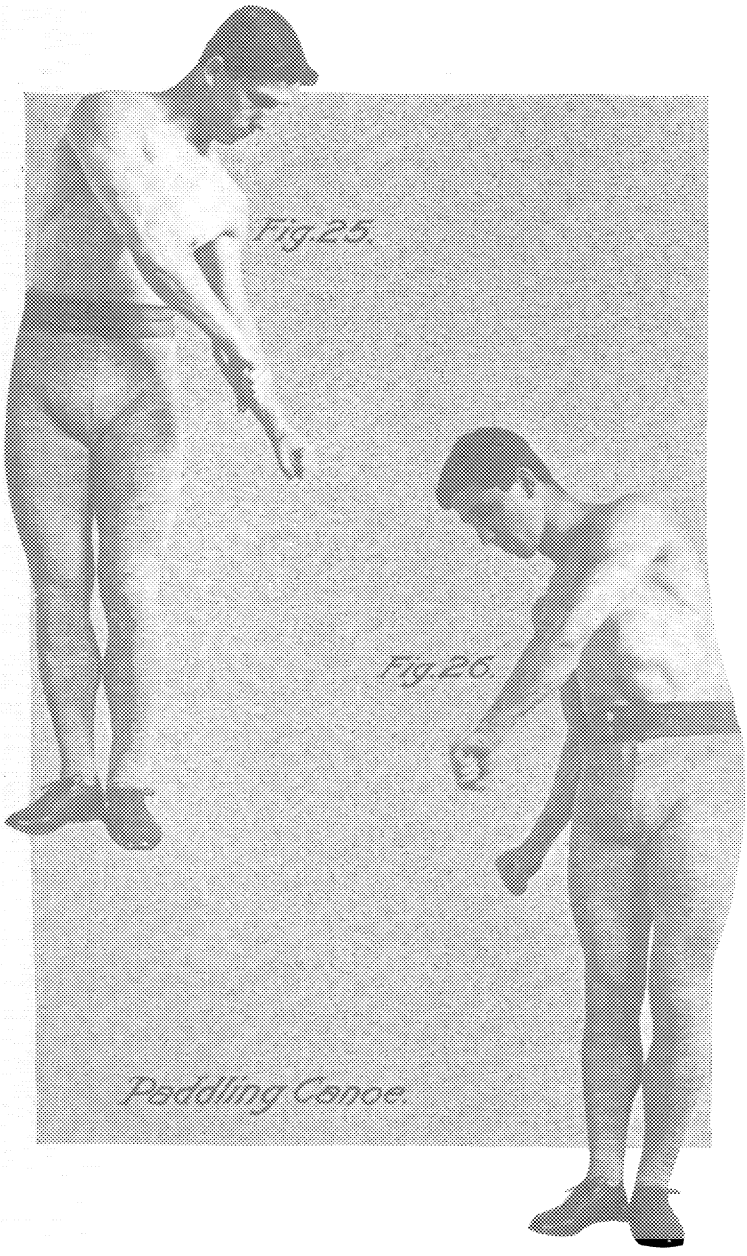


Fig.25.

Fig.26.

Paddling Canoe

Exercise 14

HEAVING THE LEAD

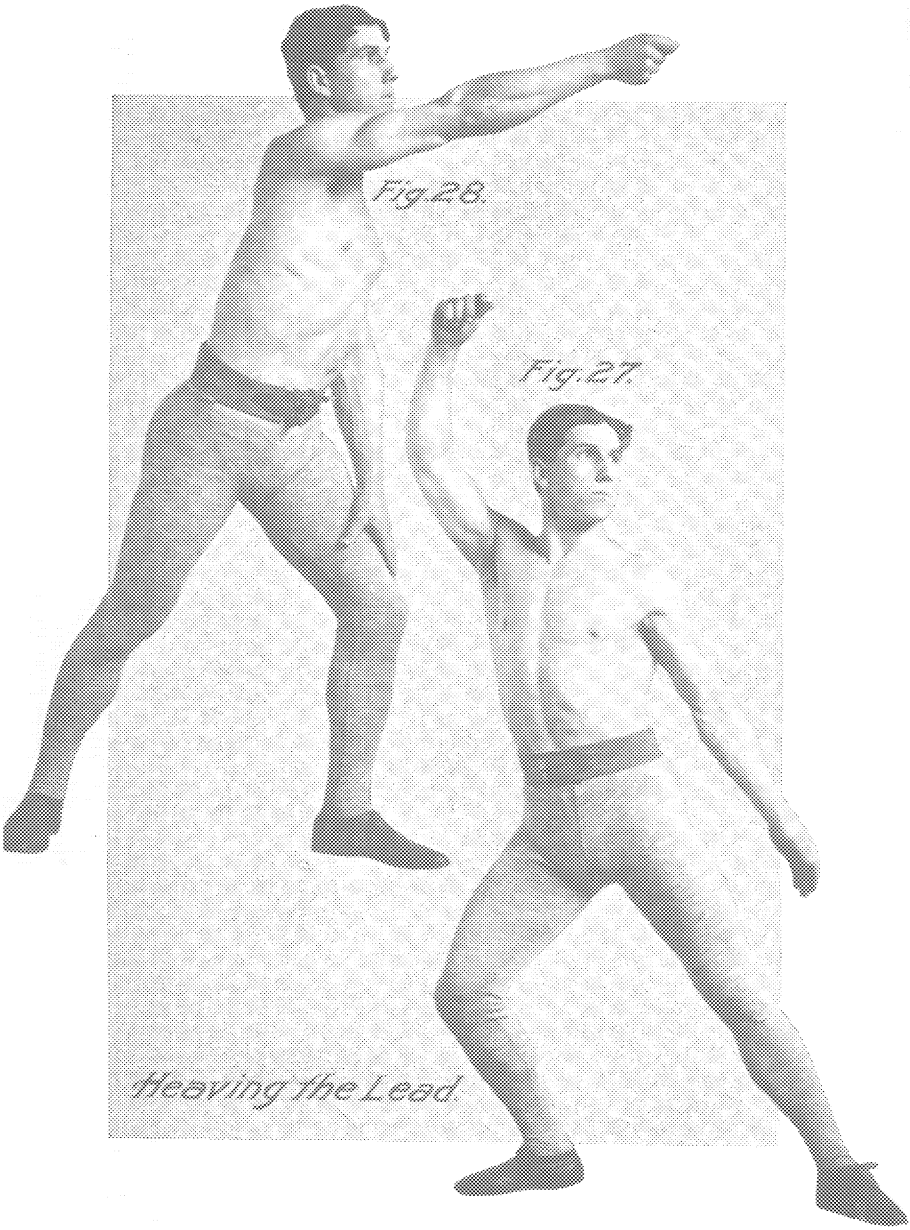
Position — Stand with the feet about thirty inches apart, the right hand elevated above the head, the left arm extended downward by the side, and the weight thrown on to the right leg, as shown in Fig. 27.

Movement — Swing the right arm downward and outward to the right across the body and up into the position shown in Fig. 28, with the weight thrown on to the left leg, and the left hand resting on the left knee. Now settle back to the first position, and repeat the movement. Reverse the movement, using the left arm.

Times — 15 — 25 — 40. Rate per minute, 10 — 20 — 30.

Caution — In starting this exercise, sway the body well over to the right, energize the downward circular movement, turn the body to the left as the arm descends, and bring it to a full stop in the extended position shown in the illustration.

Parts Affected — Anterior and middle of shoulder, entire chest, waist, oblique muscles of the abdomen, and back, legs, and arms to a lesser degree.



Heaving the Lead.

Exercise 15

STEAMBOAT

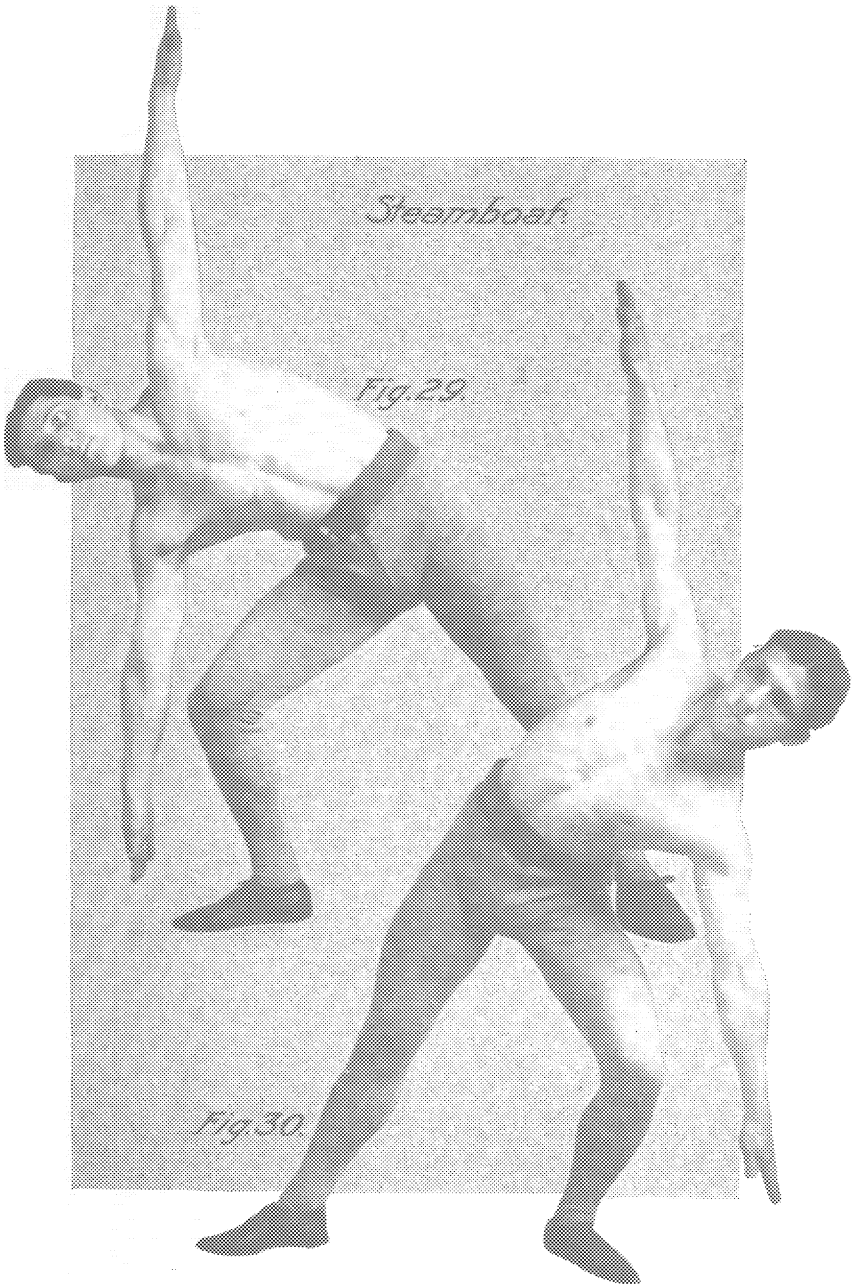
Position — Stand with the feet about thirty inches apart, the weight thrown on the right leg, the right arm extended downward with fingers near the floor, and the left arm extended perpendicularly upward. See Fig. 29.

Movement — From the first position, straighten the right leg, erect the trunk, and swing over into the opposite position, with the weight thrown on to the left leg, the left hand near the floor, and the right arm elevated, as shown in Fig. 30. Repeat the movement, alternating from right to left side.

Times — 15 — 25 — 40. Rate per minute, 10 — 20 — 30. Counting each movement to right and left.

Caution — Hold the arms rigidly straight in a plane, at right angles to the body. Move arms and body together as one, and shift the weight alternately from one leg to the other.

Parts Affected — Extensors of the legs, abductors of the thighs, and the muscles on the sides of the neck, waist, abdomen, back, and hips. The muscles of the arms and shoulders are less actively engaged, though they are under considerable tension.


Steamboat
Fig. 29
Fig. 30

Exercise 16

HOISTING SAIL

Position — Stand with the feet twenty-four inches apart, with legs slightly bent at the knee, right arm extended straight upward, and the left first resting on the upper part of the left thigh, as shown in Fig. 31.

Movement — Pull downward with the right arm until the right fist rests on the right thigh, and at the same time push upward with the left arm until it is extended above the head, as shown in Fig. 32. Repeat, alternating position of arms and hands.

Times — 20 — 30 — 40. Rate per minute, 40 — 60 — 80.

Caution — Every downward pull should be accompanied with a bending of both knees, and a swaying of the body to the right when the right arm is pulled down, and to the left when the left arm descends.

Parts Affected — Large muscles in front of both thighs, calves, and gluteal muscles, also extensors and flexors of the arms, the shoulders, chest, and oblique muscles of the abdomen.

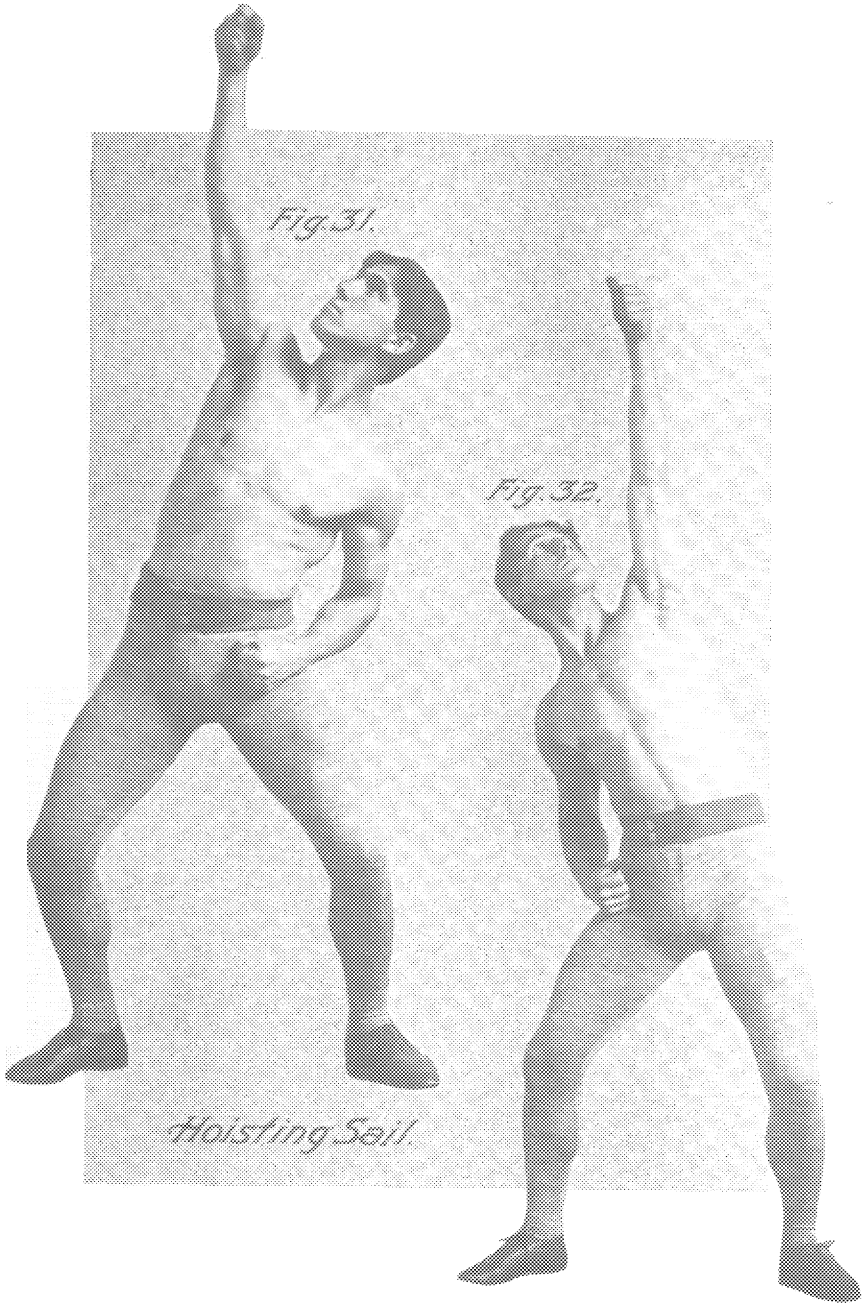


Fig. 31.
Fig. 32.
Hoisting Sail.

Exercise 17

THROWING THE DISCUS

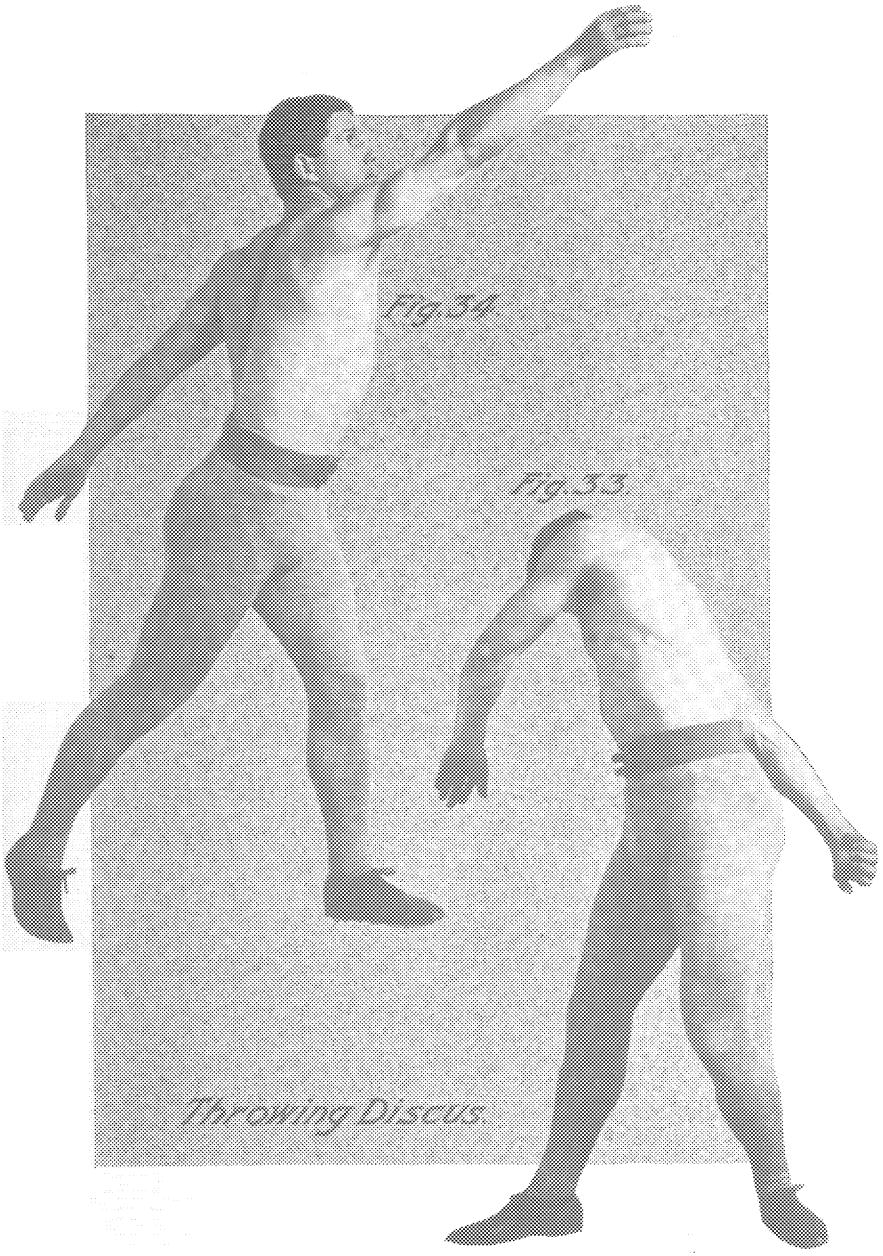
Position — Stand with the feet about twenty-four inches apart. Swing the right arm around behind the body until it comes back of the left hip, turning the body in the same direction, and using the left arm to preserve the balance, as shown in Fig. 33.

Movement — Starting with the weight on the right leg, swing the body and right arm around energetically to the left, springing from and turning upon the ball of the right foot, until the right arm is fully extended upward, and the weight thrown on to the left leg, as shown in Fig. 34. Repeat the movement. Reverse the position, and swing with the left arm.

Times — 10 — 20 — 30. Rate per minute. 12 — 16 — 20.

Caution — In this exercise lay great stress upon starting the movement from the right leg, and using the left arm to help turn the body while concentrating all the energy upon the final effort of the right arm.

Parts Affected — Nearly all parts of the body in a mild degree, with special stress upon the chest muscles, and the oblique muscles of the abdomen and rotators of the spine, trunk and legs.



Throwing Discus.

Exercise 18

CROUCHING START

Position — Sink on the right leg, extend the left leg backward so that the feet will be about twenty-four inches apart, and lean forward so as to support the weight of the front part of the body by the arms and hands, as shown in Fig. 35.

Movement — While maintaining the above position of supporting the weight of the front part of the body by the arms and hands, shift the weight from the right to the left leg (see Fig. 36), and from left to right successively. Repeat.

Times — 20 — 40 — 60. Rate per minute, 40 — 48 — 56.

Caution — In this exercise see that the near leg is fully extended, and that the front foot comes within at least twelve inches of the hands on the floor.

Parts Affected — Extensor muscles on the back of the arms, muscles of the chest, back of the neck, and extensors and flexors of the thighs and legs. Very trying exercise on the respiration and circulation.

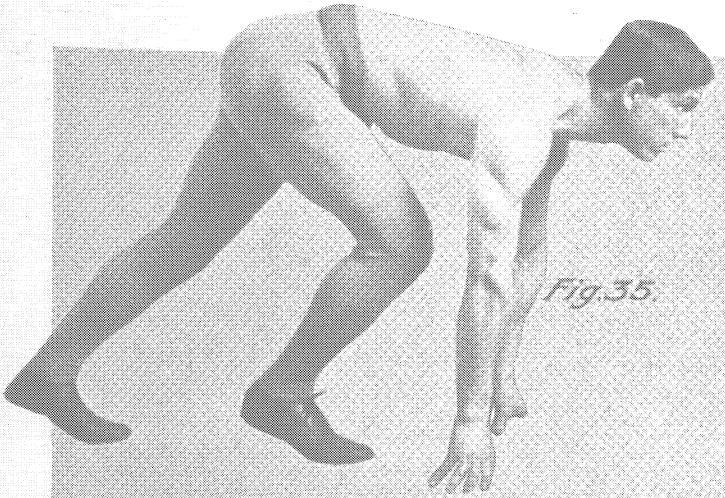


Fig. 35.

Crouching Start.

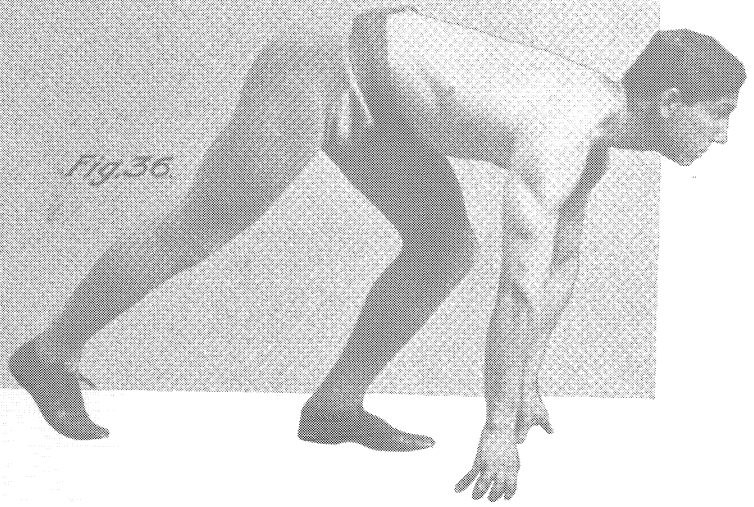


Fig. 36.

Exercise 19

BOXER'S GUARD

Position — Stand with the feet about twenty-four inches apart, right foot advanced, weight thrown back on to left leg, with left arm bent at right angles across the front of the neck, and the right arm extended backward, as shown in the illustration, Fig. 37.

Movement — While maintaining the same position with the feet, straighten the left leg, throw the weight forward on to the right leg, at the same time bringing the right forearm up opposite the neck, and extending the left arm backward. (See Fig. 38.) Repeat the movement, springing alternately from the right and left foot. Place the left foot in advance and try the same exercise.

Times — 20 — 40 — 80. Rate per minute, 12 — 24 — 36.

Caution — In springing forward and back from the balls of the feet, do not allow the heels to be raised from the floor, and be careful to preserve the rhythm of movement between the arms and legs.

Parts Affected — Principally extensors and flexors of the legs and arms, also in a milder degree the muscles of the shoulders, back, abdomen, and chest.

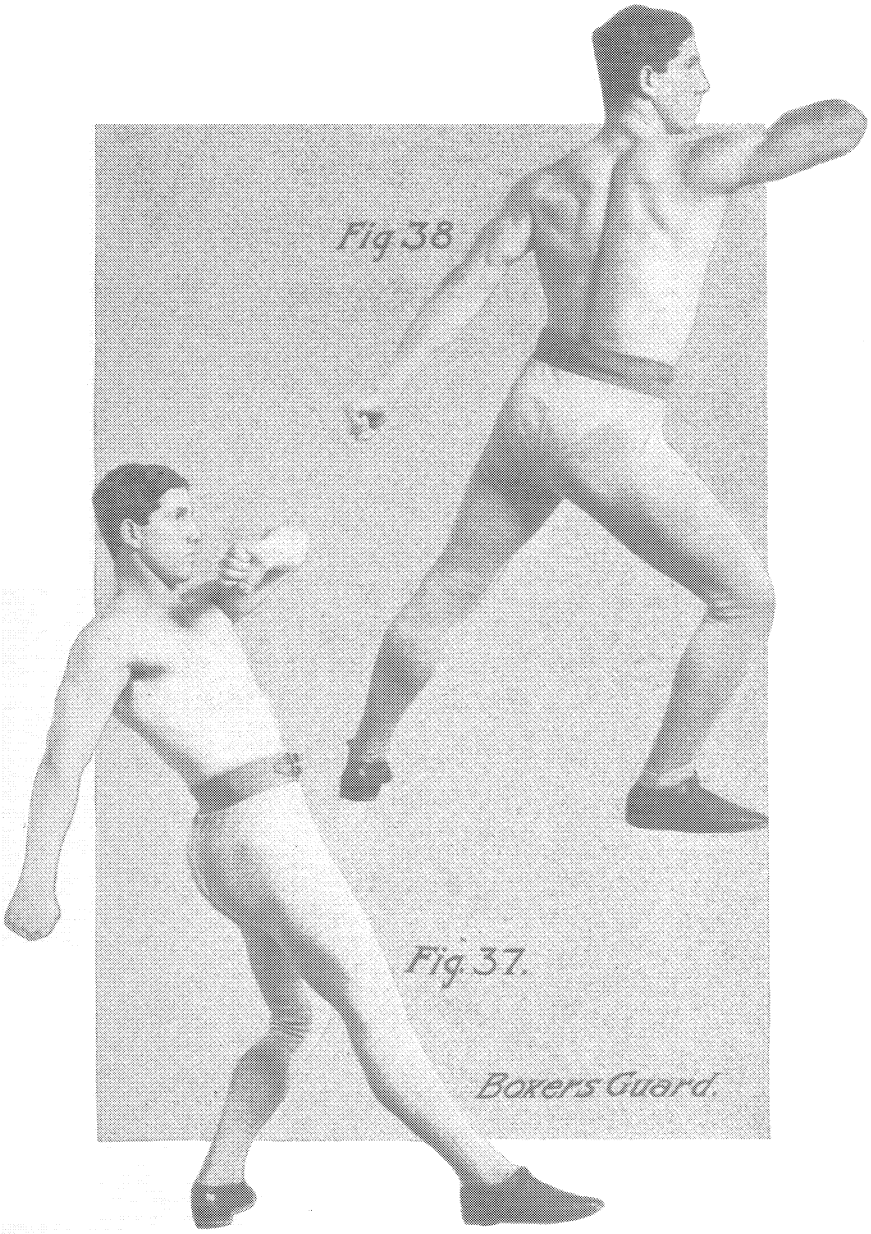


Fig 38

Fig 37.

Boxers Guard.

Exercise 20

WINDMILL

Position — Stand with the feet together, and the left arm extended in a horizontal plane directly forward, and the right arm extended in the same plane directly backward, as shown in Fig. 39.

Movement — While keeping both arms rigidly straight and in the same line with each other, bring the right arm over in a circular movement to the position occupied by the left arm, while the left arm at the same time is swung downward and backward in a circular movement to the position first held by the right arm, as shown in Fig. 40. Repeat. Reverse the movement.

Times — 10 — 20 — 30. Rate per minute, 16 — 32 — 48.

Caution — In executing this exercise, special stress must be laid upon keeping both feet firm on the floor, pivoting at the hips only, and making the continuous circular movements of the arms in as near a perpendicular plane as possible.

Parts Affected — Anterior, middle, and posterior part of shoulders, upper chest, upper back, and waist. Rotators of the neck, trunk, and spine.

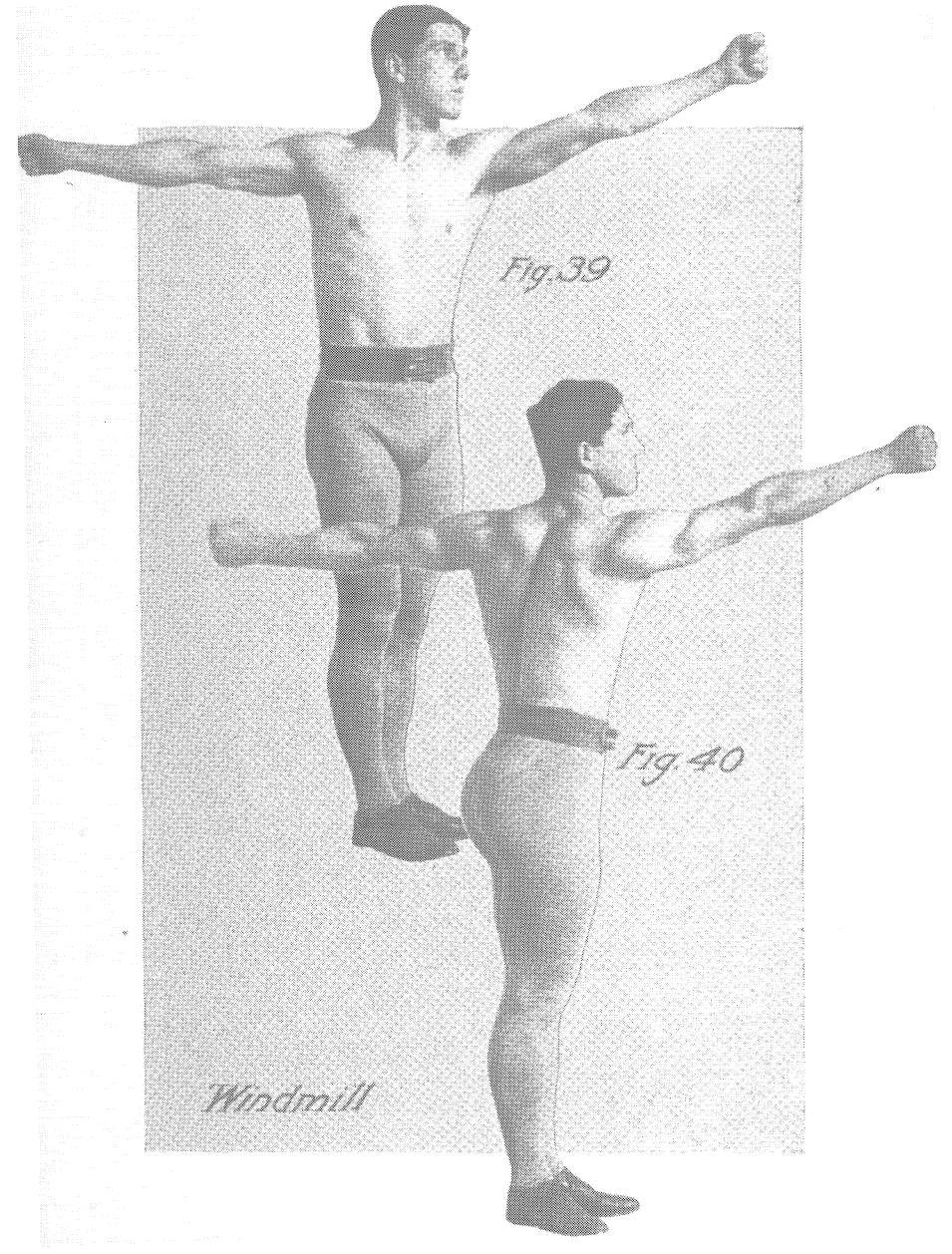


Fig. 39
Fig. 40
Windmill

Exercise 21

LOCOMOTIVE

Position — Stand on the right leg, draw up the left leg, extend the right arm, and draw back the left arm to the position shown in Fig. 41.

Movement — Reverse the position as described above, by putting down the left foot, elevating the right, and at the same time extending the left arm forward, and drawing back the right arm, as shown in Fig. 42. Continue, alternately hopping from one foot to the other as in running.

Times — 30 — 60 — 100. Rate per minute, 60 — 80 — 100.

Caution — In doing this exercise, be sure and move the arm forward as the opposite knee is elevated, and move both in the same cadence or uniform rate of speed.

Parts Affected — The calves of the legs, flexors of the thighs, extensors and flexors of the arms, and muscles of the lower chest, anterior and posterior parts of the shoulders, and upper back.

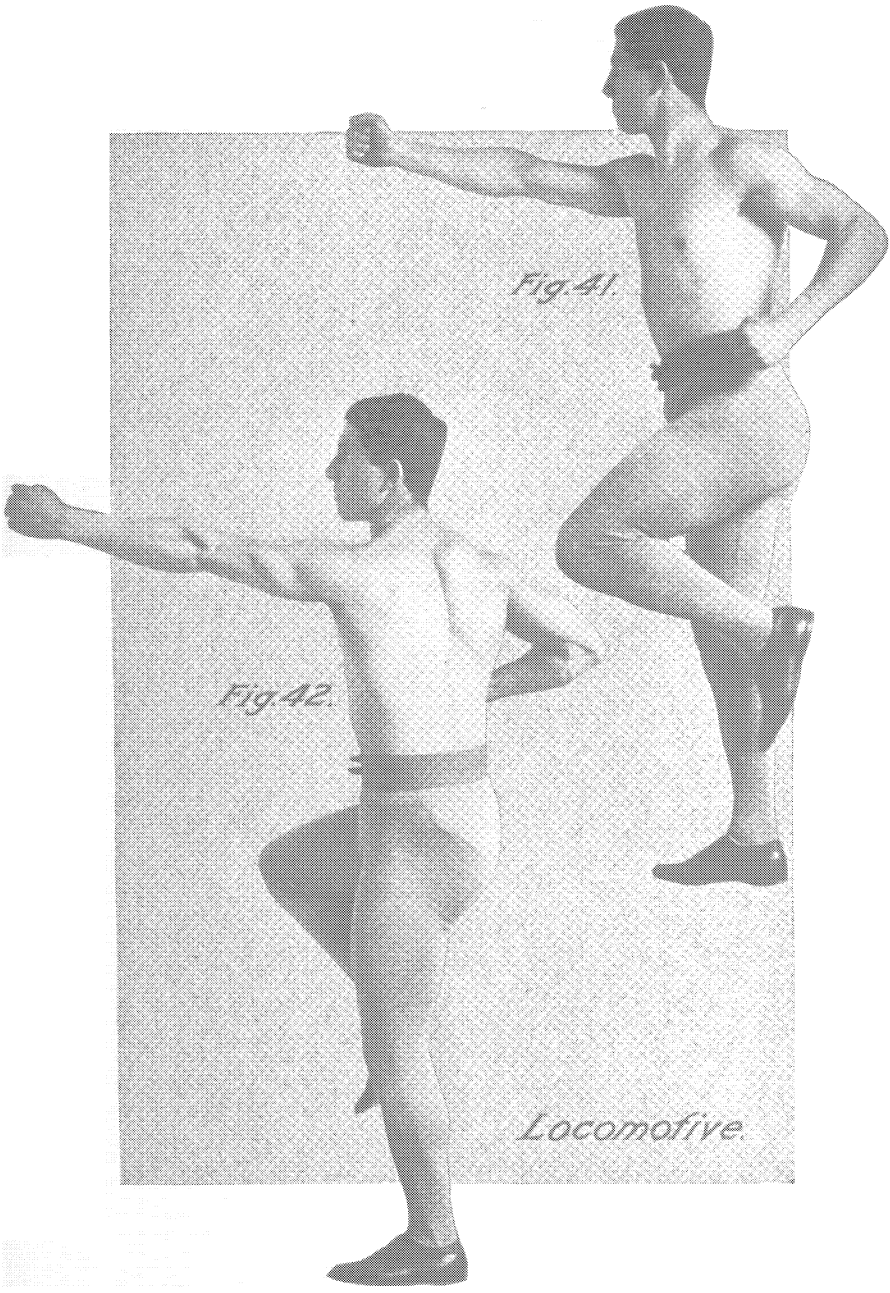


Fig. 41.
Fig. 42.
Locomotive.

Exercise 22

SWIMMING (SIDE STROKE)

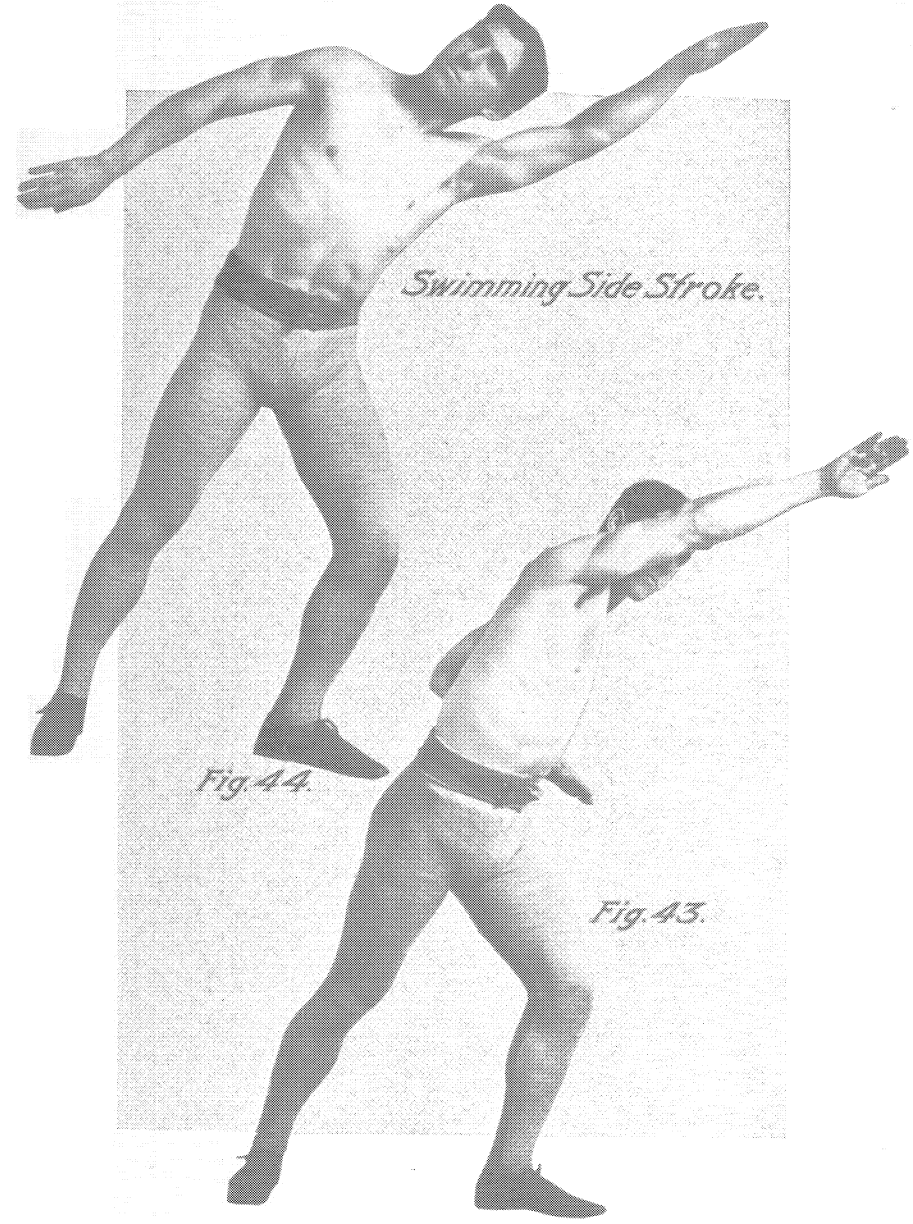
Position — Stand with the feet about twenty-four inches apart, the left foot advanced, and the weight thrown on to the left leg, while the right arm is well extended, and the left arm bent at the left side, as shown in Fig. 43.

Movement — Sweep the right arm downward and backward, settling at the same time back on to the right leg. Then extend the left arm to the position shown in Fig. 44, and pull the left arm back to the position shown in Fig. 43. Repeat, changing position of legs.

Times — 20 — 40 — 80. Rate per minute, 16 — 32 — 48, counting the advanced arm only.

Caution — When the left leg is in front, spring from the right foot and reach forward as far as possible with the left arm, turning the head and body to the right, and letting the right arm follow forward in the movement in the same direction, settling back on to the right leg every time the right arm is brought backward.

Parts Affected — The extensor muscles of the right and left arms and legs, and the muscles of the chest, shoulders, and side walls of the abdomen.



Swimming Side Stroke.

Fig. 44.

Fig. 43.

Exercise 23

CHICKEN WINGS

Position — Stand with feet together and thumbs in the armpits, and elbows at the sides, as shown in Fig. 45.

Movement — Raise both elbows as high as possible, and at the same time raise the left knee waist-high, as shown in Fig. 46. Lower the elbows and knee to the first position, then raise the elbows and right knee. Continue the exercise, raising the elbows and left and right knees alternately.

Times — 20 — 40 — 80. Rate per minute, 20 — 40 — 60.

Caution — In doing this exercise, try and maintain perfect poise on the leg left standing, and take a full breath each time the elbows are raised, and expel the air from the lungs as the elbows are lowered.

Parts Affected — Middle part of the shoulders, sides of the neck, and upper chest and back. The extensors of the legs and sides of the waist in maintaining the poise, and the flexors of the thighs in raising the knees.

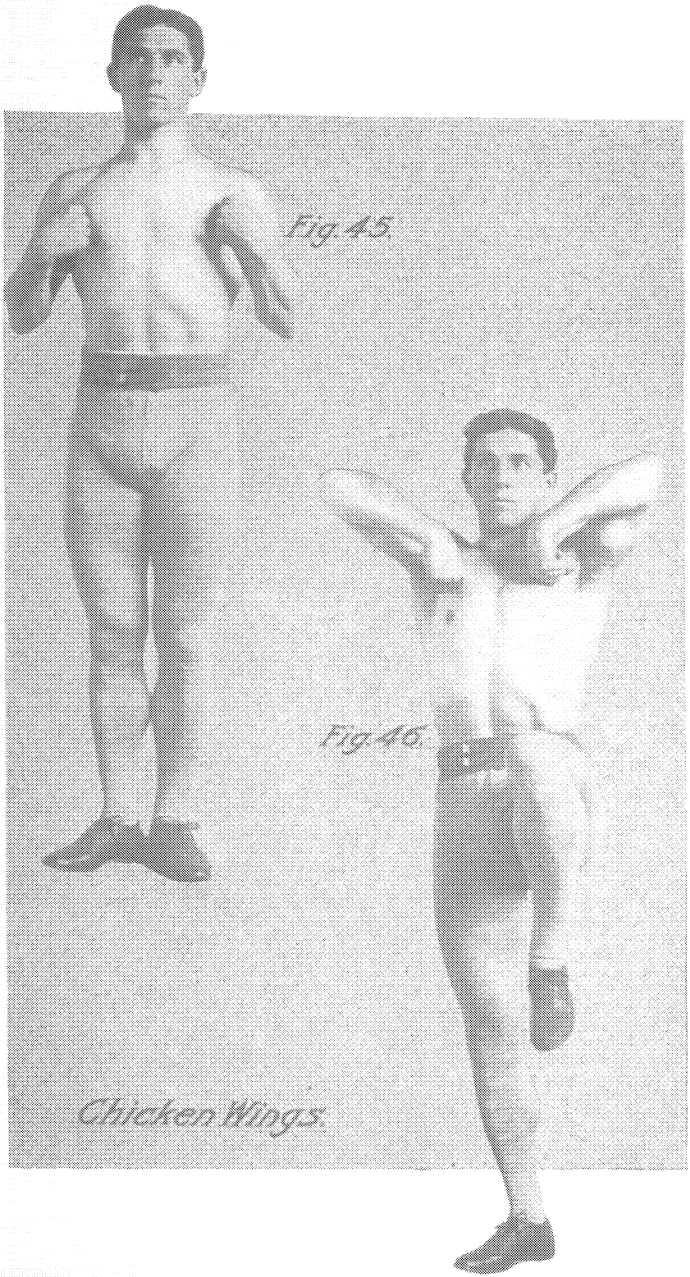


Fig. 45.

Fig. 46.

Chicken Wings.

Exercise 24

THE GRAND BEND

Position — Stand with the feet about eighteen inches apart, body bent far forward, and arms extended so that the fingers touch the floor between the heels. See Fig. 47.

Movement — From the above position carry the arms directly forward, upward, and backward until they reach the position shown in Fig. 48, with knees, hips, and ankles flexed, trunk bent backward as far as possible, and arms extended straight back over head. Return to first position and repeat.

Times — 5 — 15 — 30. Rate per minute, 8 — 12 — 16.

Caution — Try and keep the knees straight in bending forward, and be careful about bending far back of the vertical position at first, especially if there is any tendency to abdominal weakness, or a rupture.

Parts Affected — This exercise first stretches the muscles of the back, abdomen, and legs, and then brings them into powerful contraction. Nearly all of the muscles on the front and back of the body and legs are involved in the execution of this exercise, but the greatest strain comes upon the back and abdomen, and the hamstring muscles back of the thigh.

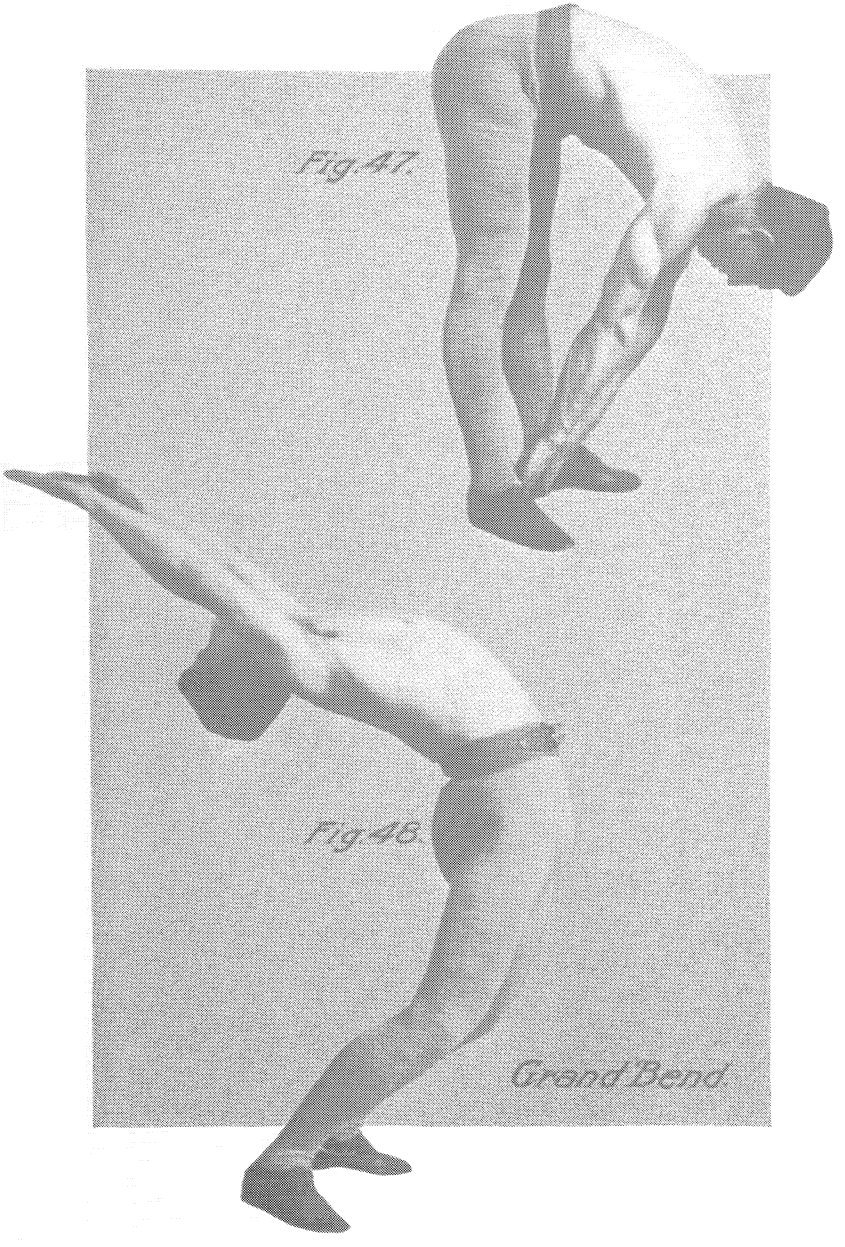


Fig. 47.
Fig. 48.
Grand Bend.

Exercise 25

MOWING

Position — Stand with the feet about eighteen inches apart, the right and left arms extended downward to the right, as shown in Fig. 49.

Movement — Bend the knees slightly, incline the body forward, and sweep both of the arms around to the left, coming up to the position shown in Fig 50. Now swing both arms in the same way around to the right. Repeat.

Times — 20 — 40 — 80. Rate per minute, 10 — 20 — 30.

Caution — In order to get the best effect from this exercise, keep the arms as straight as possible, turn the head and trunk with the arms, and sway the hips over to the opposite side from which the arms are swinging.

Parts Affected — Anterior part of the shoulders, middle chest, broad muscles of the back, oblique muscles of the abdomen, sides of the waist, and the extensor muscles of the spine and legs to a more limited degree.

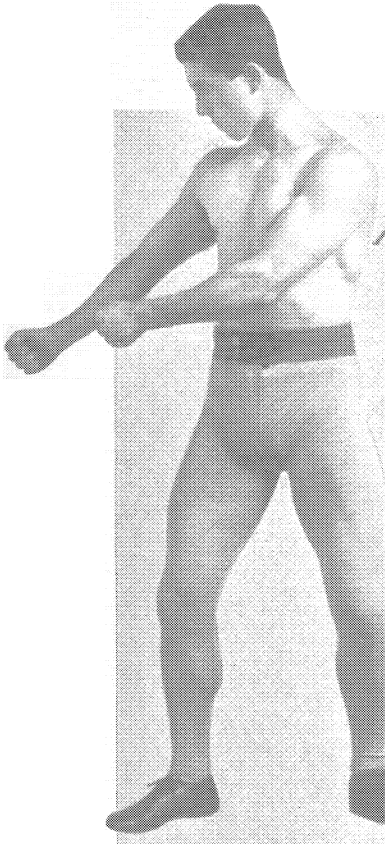


Fig. 49.

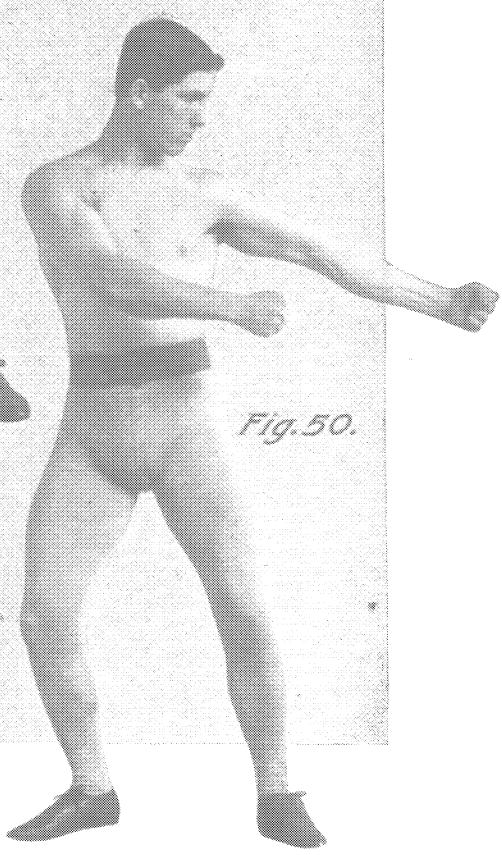


Fig. 50.

Mowing.

Exercise 26

BOWLING

Position — Stand with heels together, left foot pointing to the left, trunk inclined forward at a right angle, arms extended downward, and fingers together as if grasping a bowling-alley ball. See Fig. 51A.

Movement — Lunge forward with the left foot about forty inches, at the same time extend the right arm horizontally backward and fold the left arm across the front of the body raised to a semi-erect position. See Fig. 51B. From this position swing the right arm directly forward until the hand is about two feet beyond the left leg, and place the left hand on the left knee. See Fig. 52. Return to first position and repeat. Face to the right and bowl with the left hand.

Times — 15 — 25 — 35. Rate per minute, 10 — 20 — 30.

Caution — Keep the rear leg straight and make the movement a continuous one, from the position when first holding the ball, through the lunge, to the final point of delivery, where the hand stops suddenly.

Parts Affected — The adductors of the thighs, the extensors of the legs principally, and the muscles of the hips, buttocks, back, shoulders, chest, and arms.

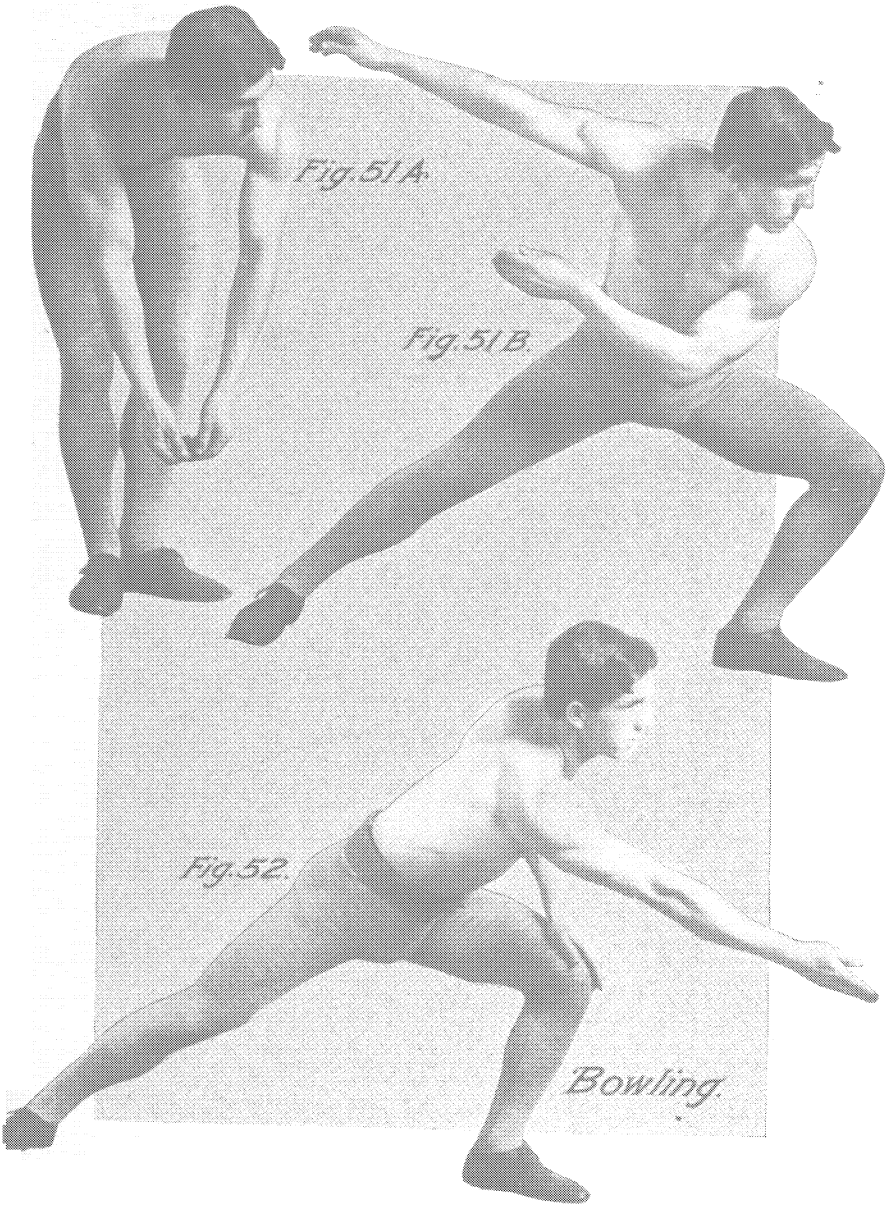


Fig. 51 A.

Fig. 51 B.

Fig. 52.

Bowling.

Exercise 27

SIGNAL STATION

Position — Stand erect, with heels together, and the hands resting upon the hips, as shown in Fig. 53A.

Movement — Straighten the right arm outward and upward to the extended position over the head, at the same time elevate the left leg sideward to the extended position shown in Fig. 53B. Lower the leg and arm and repeat. Elevate the left arm and right leg. See Fig. 54.

Times — 15 — 30 — 60. Rate per minute, 20 — 40 — 60.

Caution — Raise and lower the arm and leg simultaneously, and keep both as straight as possible. In lowering the arm, have the hand come down to the thigh and not to the hip.

Parts Affected — Muscles of natural and forced respiration put on the stretch, and side diameters of the lower chest increased; the muscles of the middle shoulder and abductors of the thighs are brought most prominently into action.

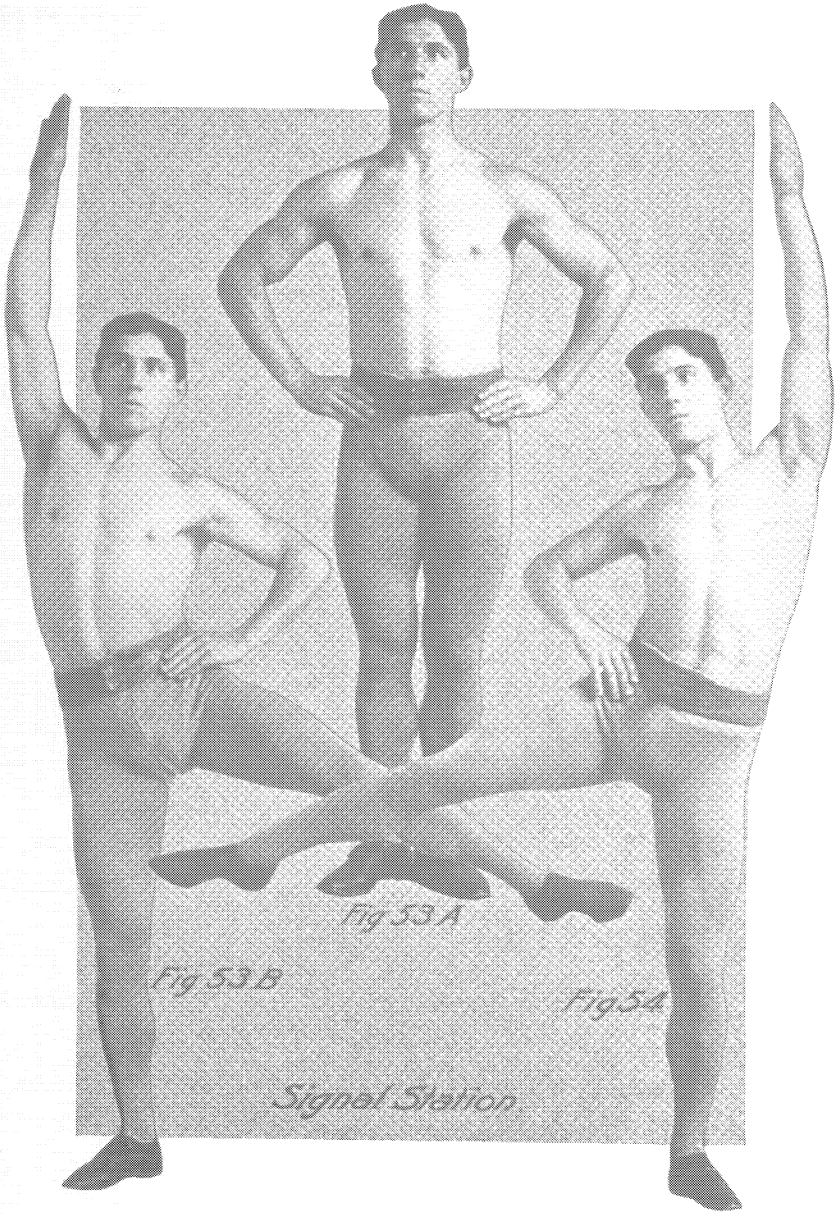


Fig 53 A
Fig 53 B
Fig 54
Signal Station

Exercise 28

FURLING SAIL

Position — Stand with the feet twenty-four inches apart, with the legs bent at the knee, the body bent forward, the right fist touching the floor, and the left fist at the junction of the left hip and thigh, as shown in Fig. 55.

Movement — Pull the right fist up to the right hip, raising the body nearly to an upright position as you do so, then immediately extend the left fist to the floor while the right fist remains at the hip, as shown in Fig. 56. Repeat.

Times — 20 — 40 — 80. Rate per minute, 20 — 40 — 60.

Caution — The knees are bent with every downward movement and straightened with every upward movement, the arms and body acting simultaneously with the legs.

Parts Affected — The principal part of the work in this exercise is brought to bear upon the extensors of the legs and lower back, though the muscles of the arms, posterior shoulder, upper back, neck, and rotators of the trunk on the pelvis come in for considerable action.

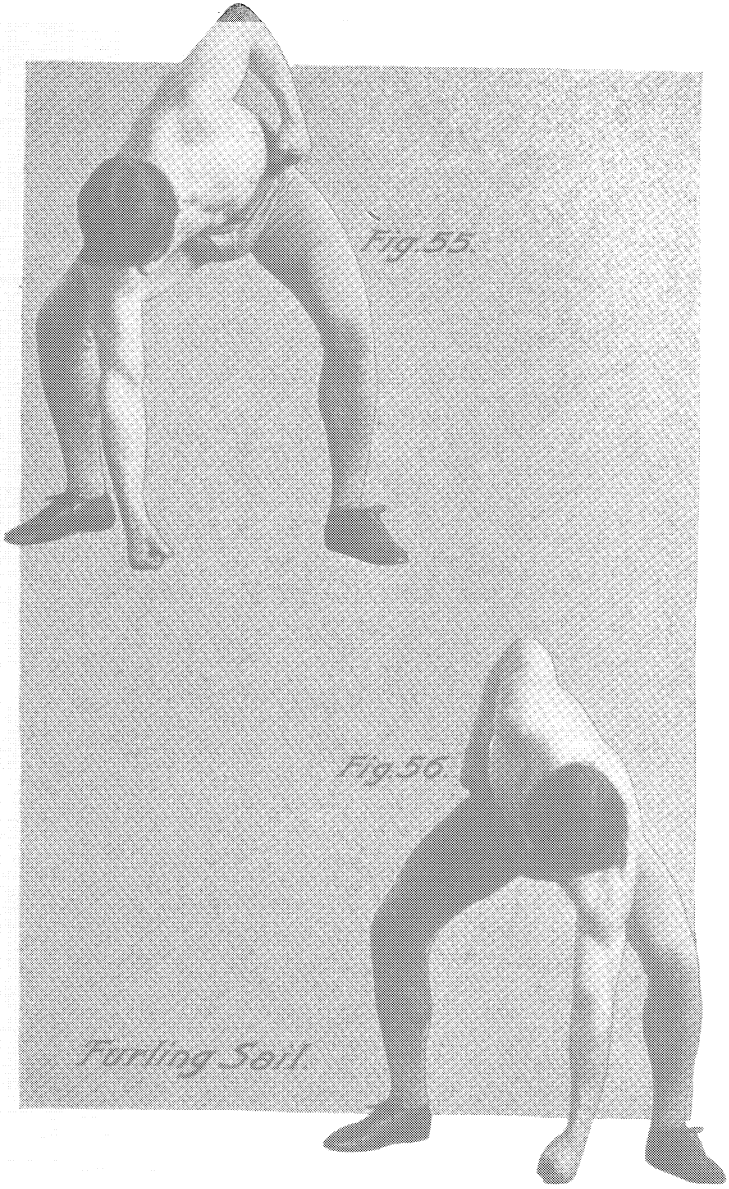


Fig 55.
Fig 56.
Furling Sail.

Exercise 29

MEASURING TAPE

Position — Stand with feet together, elbows raised shoulder high, and fingers touching the breast-bone, as shown in Fig. 57.

Movement — Step directly forward with the left foot about thirty-six inches, straightening the right leg and throwing the weight on to the left leg, and at the same time extending the arms and expanding the chest. See Fig. 58. Spring back to position and repeat the movement. Try the same exercise advancing with the right leg.

Times — 15 — 30 — 60. Rate per minute, 10 — 20 — 30.

Caution — In doing this exercise, so time it that the arms will be fully extended, and the chest fully expanded at the end of the forward movement.

Parts Affected — Chest muscles well stretched, chest expanded, and muscles between shoulders that hold shoulders back put in good tone. Large muscles on front of thigh, and muscles on the calf of the leg brought into vigorous action.

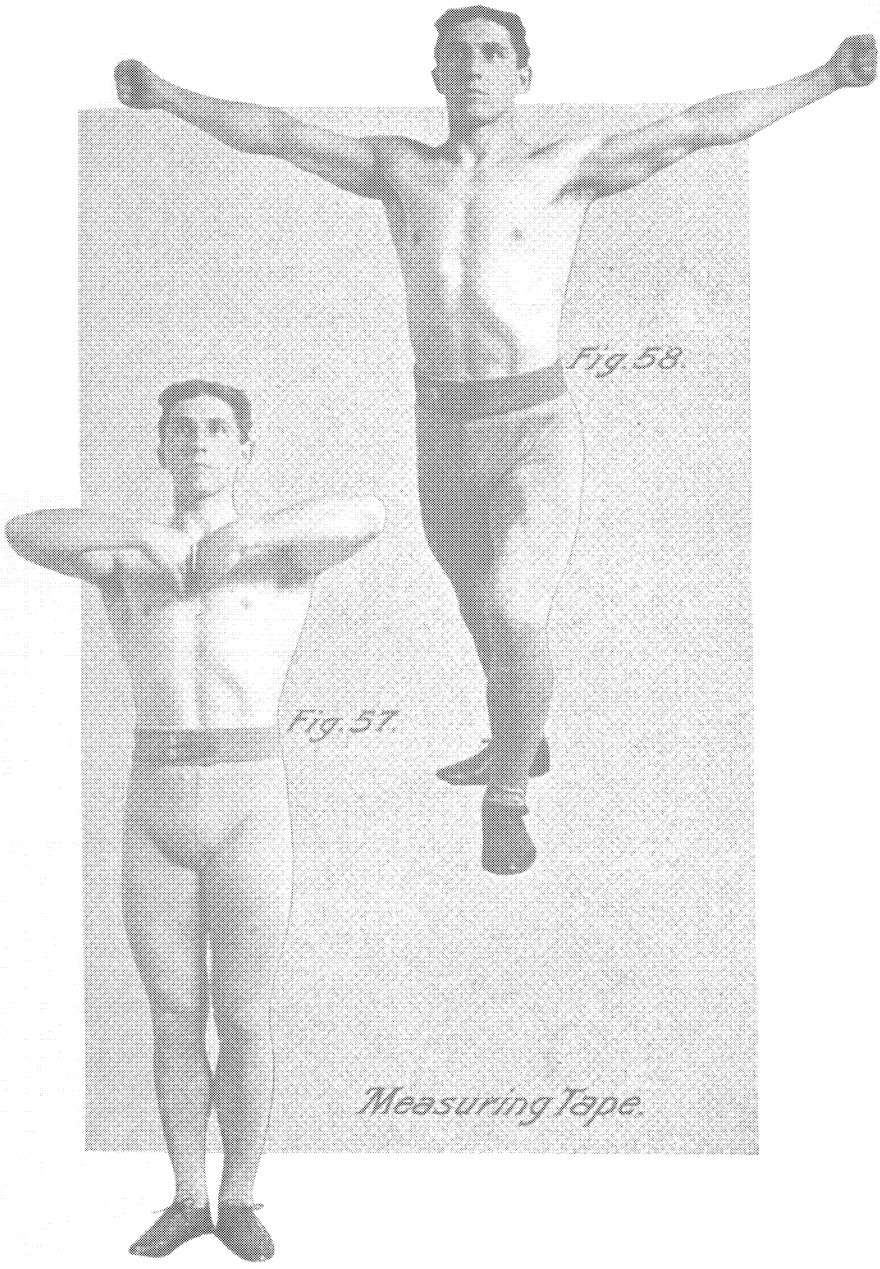


Fig. 58.

Fig. 57.

Measuring Tape.

Exercise 30

PITCHING HAY

Position — Stand with feet about eighteen inches apart, both legs bent at the knee, body inclined obliquely forward to the left, with right fist at right groin and left forearm on left thigh just above the knee. See Fig. 59.

Movement — From this position swing the left arm directly upward and backward, inclining the head and trunk backward at the same time and allowing the right fist to rest upon the upper part of the right thigh. See Fig. 60. Swing the left arm forward and downward to the starting position and repeat the movement. Reverse the position of the arms and trunk and swing the right arm upward.

Times — 15 — 30 — 60. Rate per minute, 10 — 20 — 30.

Caution — In taking this exercise, clench the hands, make the muscles of the arm tense, and swing the trunk and extended arm upward and downward together.

Parts Affected — Stretches the muscles of the chest, abdomen, and waist, opening up the thorax and increasing the breathing capacity. The muscles of the shoulders, neck, back, arms, and legs all do good developmental work.

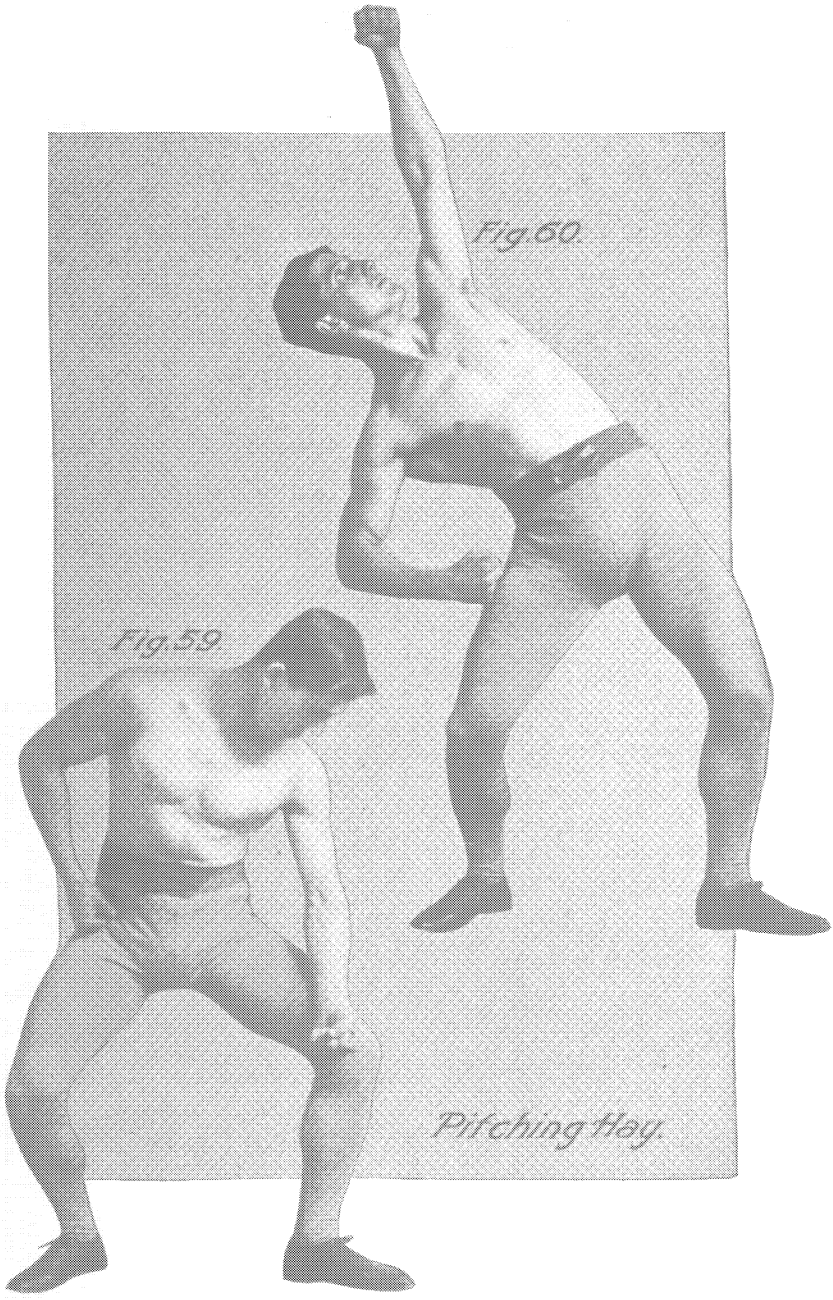


Fig.60.
Fig.59.
Pitching Hay.

Exercise 31

THROWING THE LASSO

Position — Stand with the feet about twenty-four inches apart, with the left arm across the back, the right arm above the head, and the weight of the body thrown on to the right leg, as shown in Fig. 61.

Movement — From this position, swing the right hand and arm backward from left to right in a large circle above the head, swaying the body a little at the same time. At the end of every five or six turns, swing the right arm upward and forward, turning the body to the left, and throwing the weight on to the left leg, as shown in Fig. 62. Try the same exercise with the left arm.

Times — 5 — 10 — 20. Rate per minute, 2 — 4 — 8.

Parts Affected — The muscles of the arms, shoulders, upper chest, and back. The muscles on the sides and front of the abdomen, and the front of the thighs and calves.

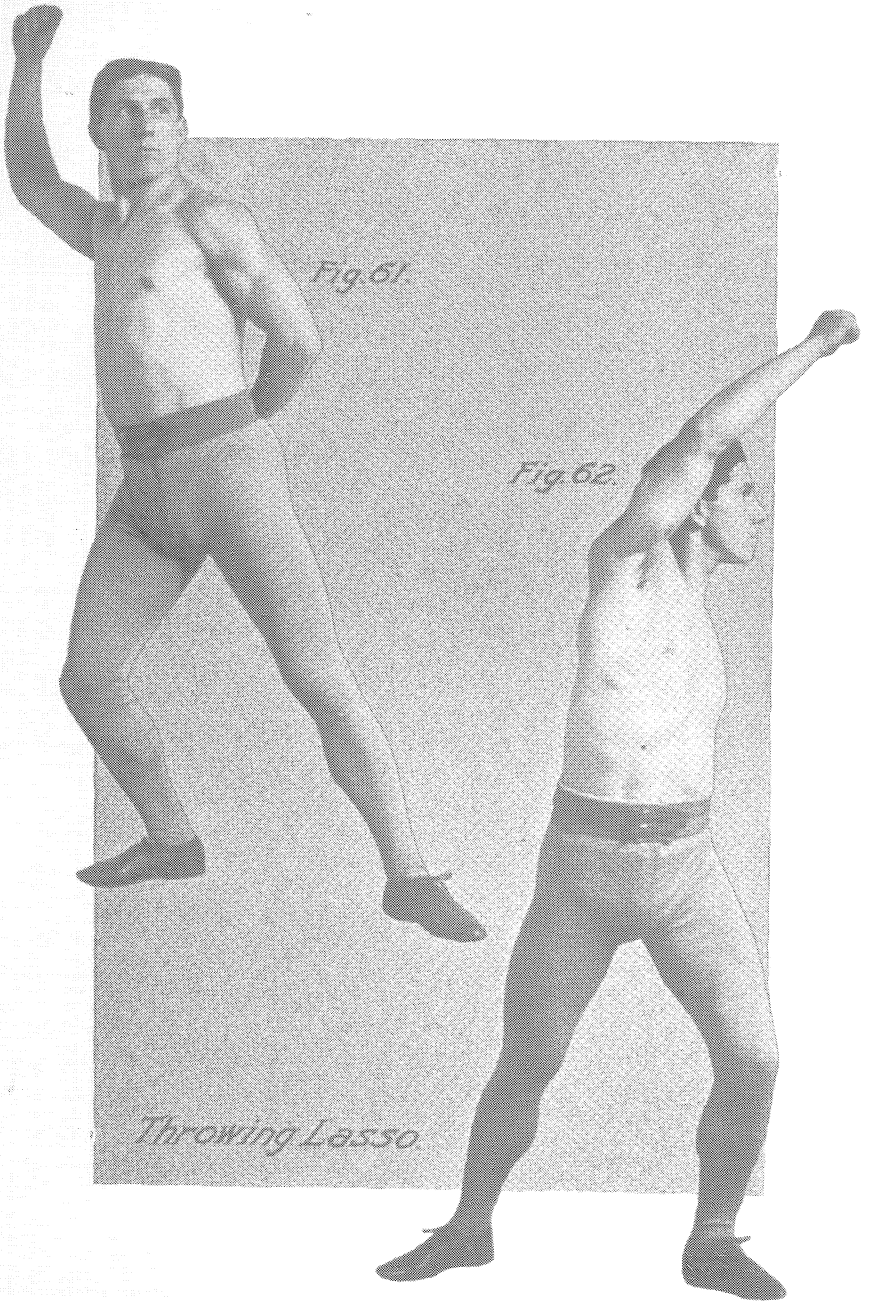


Fig. 61.
Fig. 62.
Throwing Lasso.

Exercise 32

GRINDING CORN

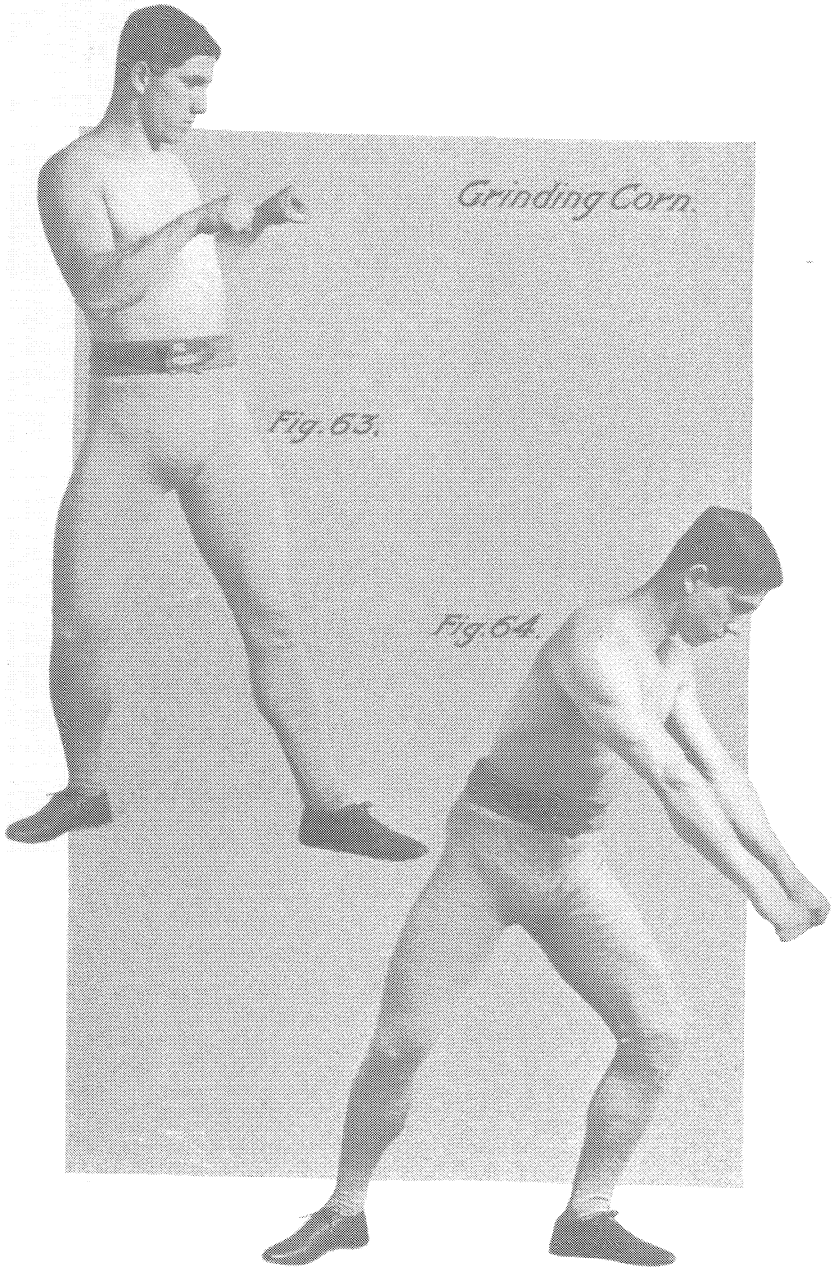
Position — Stand with the feet twenty-four inches apart, left foot advanced, with the weight thrown back on to the right leg, and the arms bent at a right angle, with elbows at the sides, as shown in Fig. 63.

Movement — From the above position, raise the clenched hands upward in front of the face, then forward, downward, and backward in a large circle, to the position shown in Fig. 64. From this position sway backward with the body, and bring the arms up into the first position. Repeat. Advance the right foot, and try the same exercise with the body and arms.

Times — 10 — 30 — 60. Rate per minute, 10 — 20 — 30.

Caution — In this exercise throw the weight of the body on to the advanced leg as the arms are carried forward, and on to the rear leg as the arms are brought backward. See that perfect harmony and rhythm of action are sustained in the movement of body, arms, and legs.

Parts Affected — Extensor muscles of the back and neck, extensor and flexor muscles of the arms, and extensors of the legs. The muscles of the chest, shoulders, and abdomen are called upon to a lesser extent.


Grinding Corn.
Fig. 63.
Fig. 64.

Exercise 33

STANDING START

Position — Stand with the feet about twenty-four inches apart, right leg advanced, right arm extended forward and upward, left arm extended downward and backward, as shown in Fig. 65.

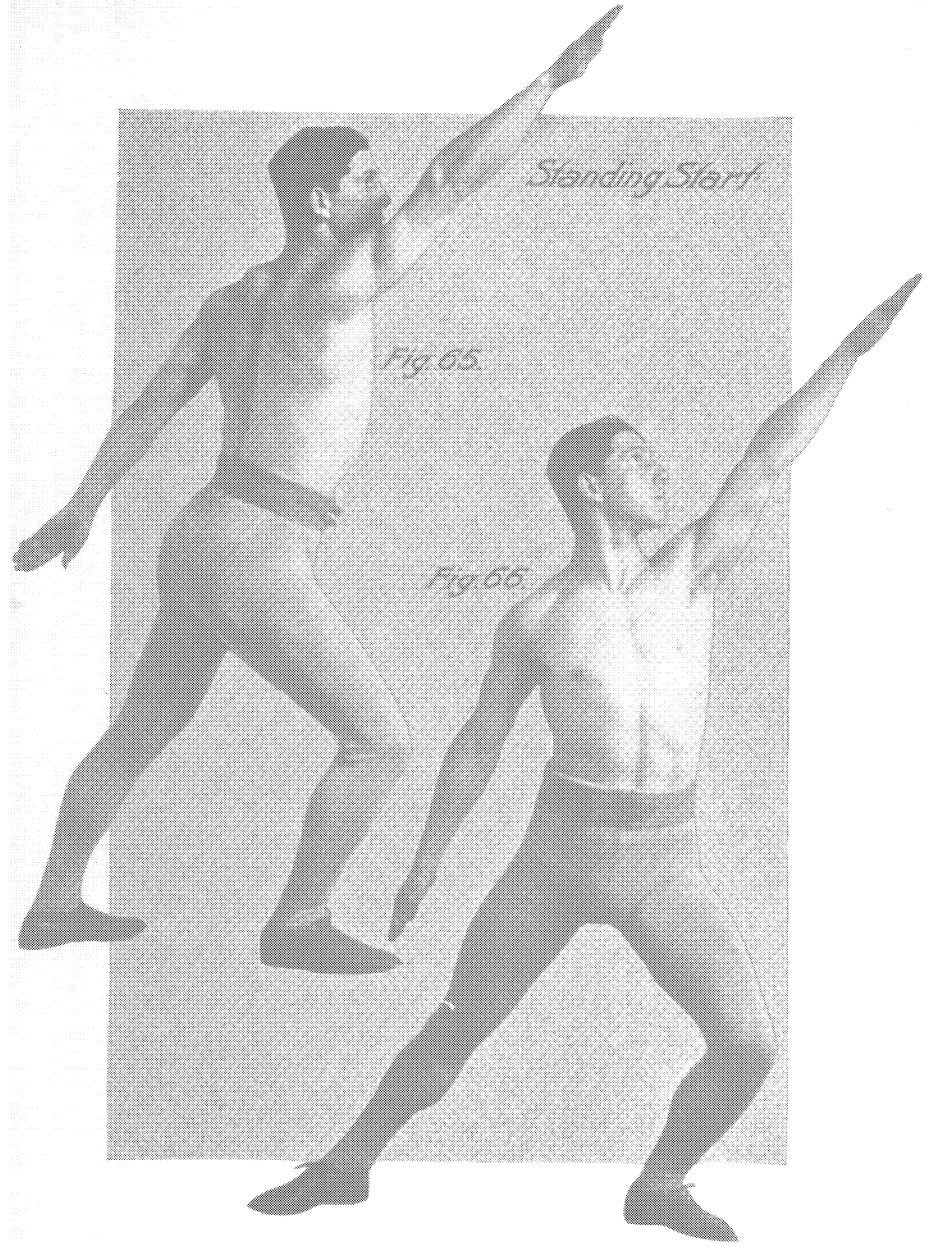
Movement — Swing the right arm downward and backward, and the left arm forward and upward, at the same time *springing* from the position with the right leg forward, to the position with the left leg forward. (See Fig. 66.) Repeat.

Times — 20 — 40 — 80. Rate per minute, 32 — 40 — 48.

Caution — In executing this exercise, keep the arms rigidly straight, and throw most of the weight successively on to the front leg. In order to get into the rhythm of the movement it is advisable to make two little steps between each stride.

Parts Affected — The shoulders, upper back, arms, and chest. The oblique muscles on the sides of the abdomen, and the extensors and flexors of the thighs and legs are especially brought into play.

Observation — A splendid exercise for the respiration and circulation.


Standing Start
Fig. 65.
Fig. 66.

Exercise 34

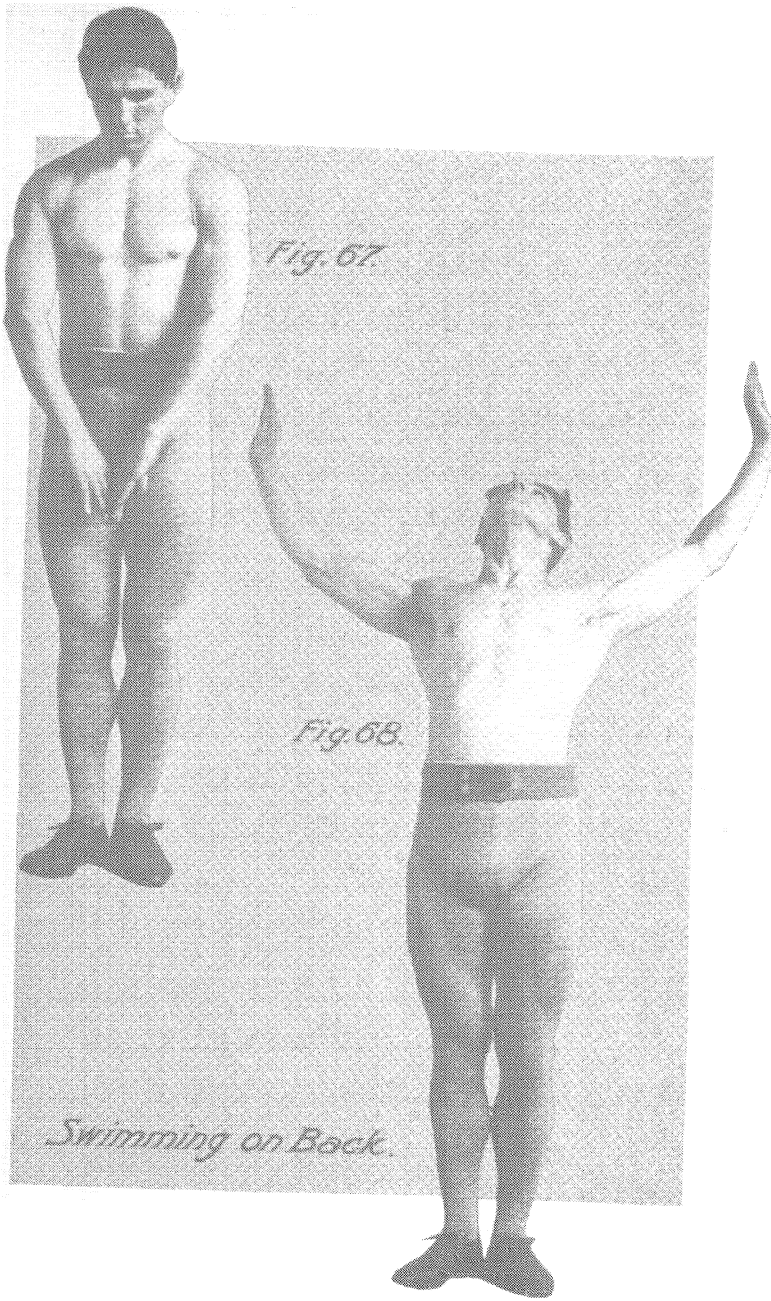
SWIMMING ON BACK

Position — Stand with the feet together, arms extended downward in front of the body with the backs of fingers touching, as shown in Fig. 67.

Movement — Sweep the arms directly upward and backward as far as possible, as shown in Fig. 68, bending the head and body backward, and carrying the arms around and downward in a circle, until the fingers touch in front of the body as in the first position. Repeat the movement. The exercise may be increased in its severity by stepping back alternately with the right and left legs.

Times — 10 — 20 — 30. Rate per minute, 12 — 16 — 20.

Parts Affected — Muscles of the shoulders, upper chest, and abdomen, as well as the extensors and flexors of the head, and the muscles of the scapulæ that hold the shoulders back.



Swimming on Back.

Exercise 35

COURTESY

Position — Stand with the legs crossed, right foot in front, hands on the hips, as shown in Fig. 69.

Movement — Swing the right leg straight outward and around, to a position about thirty inches diagonally back of the left foot, as shown in Fig. 70. Now swing the right leg outward and around to the crossed position in front of the left leg. Repeat the movement, then reverse the position of the feet, and swing the left leg around back of the right.

Times — 5 — 20 — 40. Rate per minute, 8 — 16 — 24.

Caution — In this exercise throw the weight of the body on to the advanced leg, and try and maintain perfect poise and balance throughout the entire movement.

Parts Affected — Principally the extensors and calf muscles of the advanced leg, and the abductors and adductors of the swinging leg.

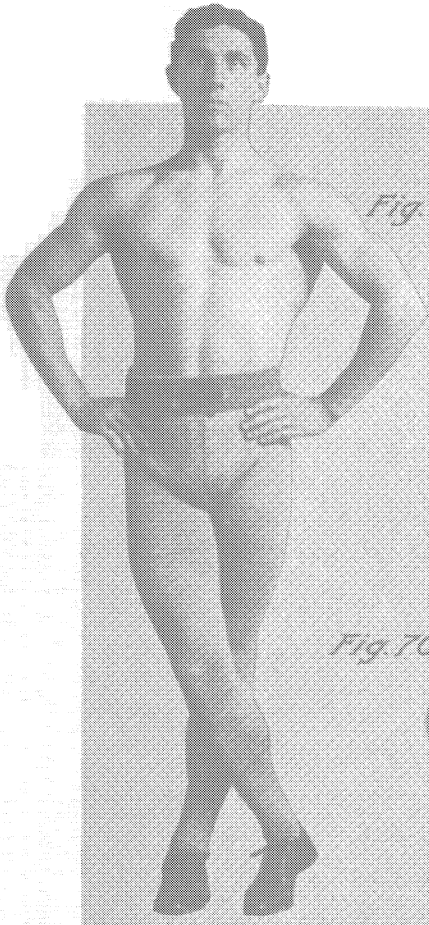


Fig. 69.

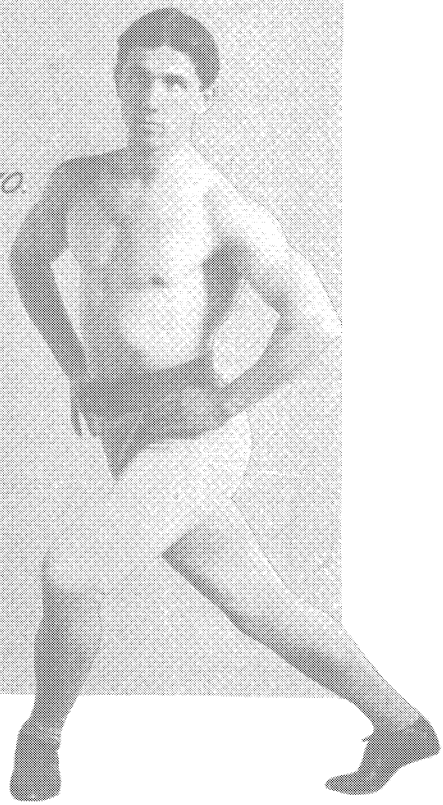


Fig. 70.

Courtesy

Exercise 36

JUMPING-JACK

Position — Stand erect with feet together and hands touching behind the back. See Fig. 71.

Movement — Bend the knees and jump to the stride position with the feet about twenty-four inches apart, at the same time swing the arms outward and upward until the backs of the hands touch over the head, as shown in Fig. 72. Now jump from the stride position to the first position, and at the same time bring the palms of the hands together behind the back. Repeat, first striking the hands behind the back, then in front of the body.

Times — 10 — 20 — 40. Rate per minute, 16 — 32 — 48.

Caution — In this exercise be sure and move the arms and legs together, and jump out and in to both positions.

Parts Affected — Extensors of the legs, and the calves, shoulders, and muscles of natural and forced respiration.

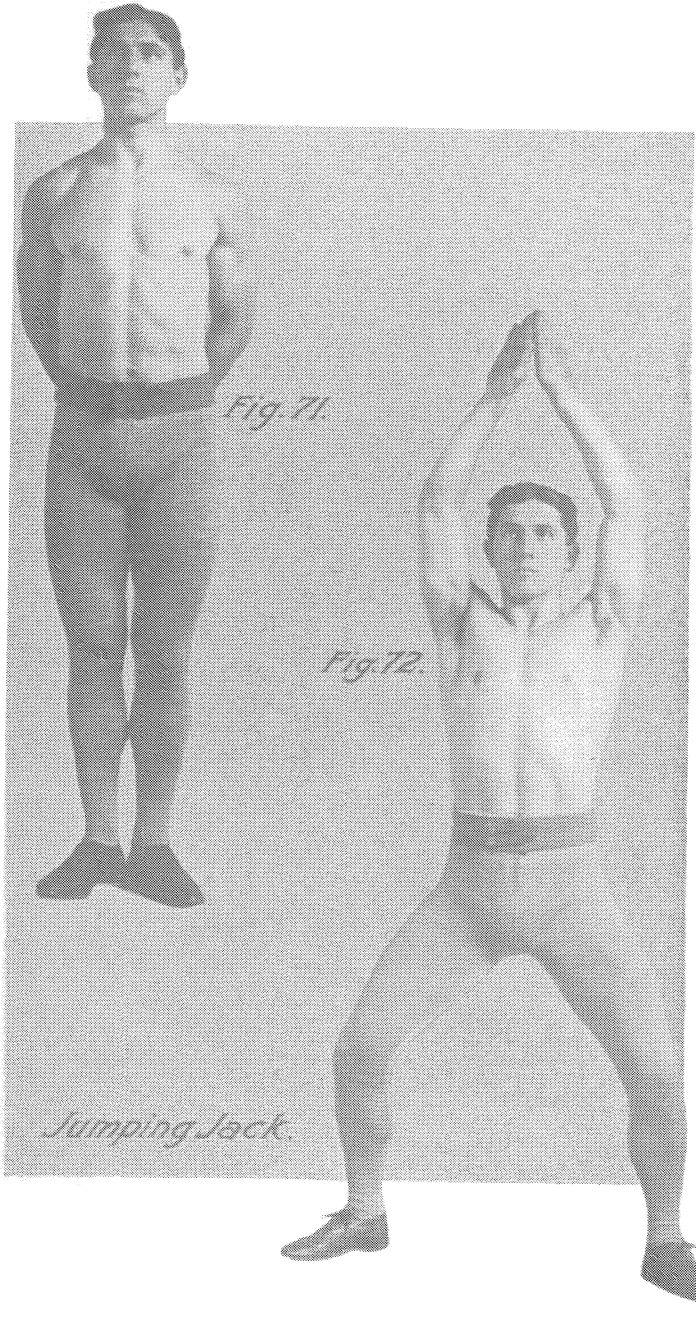


Fig. 11.

Fig. 12.

Jumping Jack.

Exercise 37

DRIVING STAKES

Position — Stand with feet about twenty-four inches apart, left leg advanced, both arms thrown back over the right shoulder, with clenched hands together and weight thrown on to the right leg, as shown in Fig. 73.

Movement — Swing the arms forward and downward with force and vigour until the clenched hands are brought to a sudden stop about six inches from the left knee, with the body inclined forward and the weight thrown on to the left leg, as shown in Fig. 74. While still holding the fists together, swing the extended arms in front of the thighs up into the first position over the left shoulder. Repeat. Reverse the movement by swinging the arms over the left shoulder.

Times — 10 — 25 — 50. Rate per minute, 10 — 20 — 30.

Caution — Throw the weight forward on to the advanced leg with every downward blow, and backward on to the rear leg every time the arms swing over the shoulder. Make a circular movement with arms and trunk as though wielding a sledge-hammer, and let the movements of body, arms, and legs be in perfect harmony.

Parts Affected — The waist, loins, and oblique muscles of the abdomen have the greatest strain. The muscles of the shoulder, upper and lower back, and arms, also those of the legs and hips, are brought into vigorous activity.

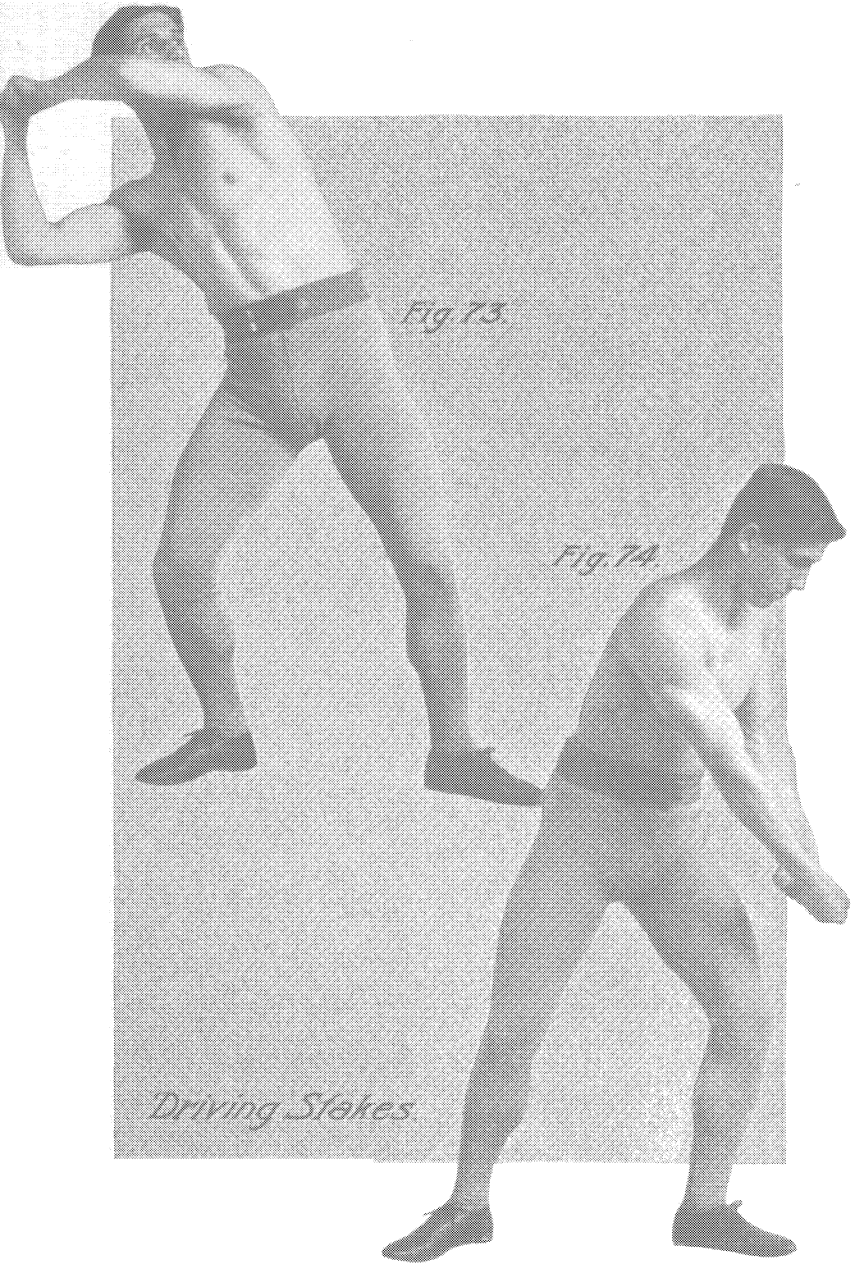


Fig. 73.

Fig. 74.

Driving Stakes.

Exercise 38

FIGHTING GLADIATOR

Position — Stand with the left foot about twenty-eight inches in advance of the right, with the weight on the right leg, the left forearm held across the lower chest, and the right forearm near the right side, as shown in Fig. 75.

Movement — Strike straight out from the shoulder with the right arm, springing at the same time from the right foot, extending the right leg and throwing the weight forward on to the left leg. As the right arm and side advance, the left arm and shoulder are drawn back. See Fig. 76. Repeat the exercise. Try the same movement with right leg advanced and position of arms reversed.

Times — 20 — 40 — 80. Rate per minute, 16 — 32 — 48.

Caution — While springing forward from the rear foot and leg, be sure and bend the advanced leg so that both feet will always remain on the floor.

Parts Affected — The extensor and flexor muscles of the right and left leg, the muscles of the calves, shoulders, extensors and flexors of the arms, the muscles of the chest and upper back, and the side muscles of the abdomen that rotate the body.

Fighting Gladiator.
Fig. 75.
Fig. 76.

Exercise 39

CLAP UNDER LEGS

Position — Stand with feet twenty-four inches apart, the right leg in advance of the left, and the arms extended over the head with backs of the hands touching. See Fig. 77.

Movement — Incline the body forward, bend the knees, and bring the arms downward and inward until the palms of the hands touch under the legs, as shown in Fig. 78. Now straighten the legs and back and swing the arms outward and upward to the first position over the head. Try the same exercise with the left leg advanced.

Times — 10 — 25 — 40. Rate per minute, 10 — 20 — 30.

Caution — In this exercise be sure and carry the body back of the erect position and have the arms fully extended over the head.

Parts Affected — Extensors of the back and legs, and muscles of the chest, shoulders, neck, upper back, and abdomen.

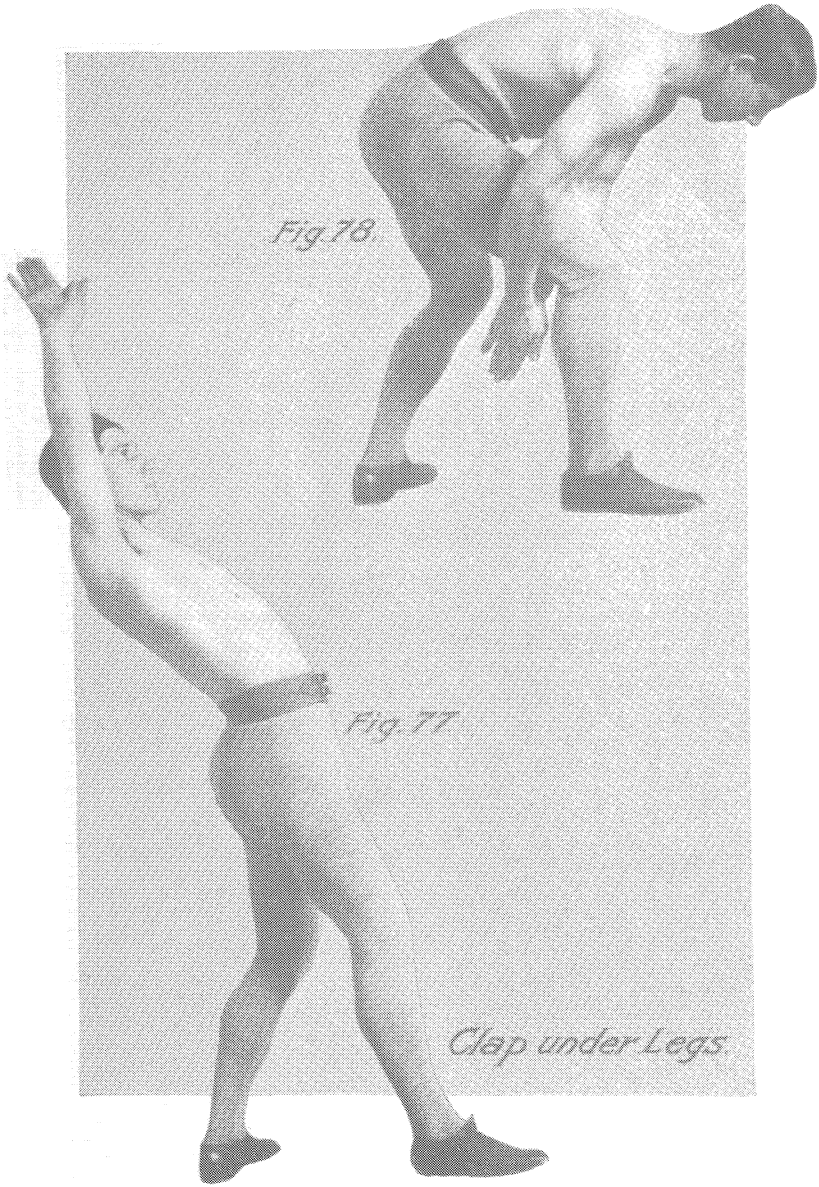


Fig. 78.
Fig. 77.
Clap under Legs.

Exercise 40

THROWING THE JAVELIN

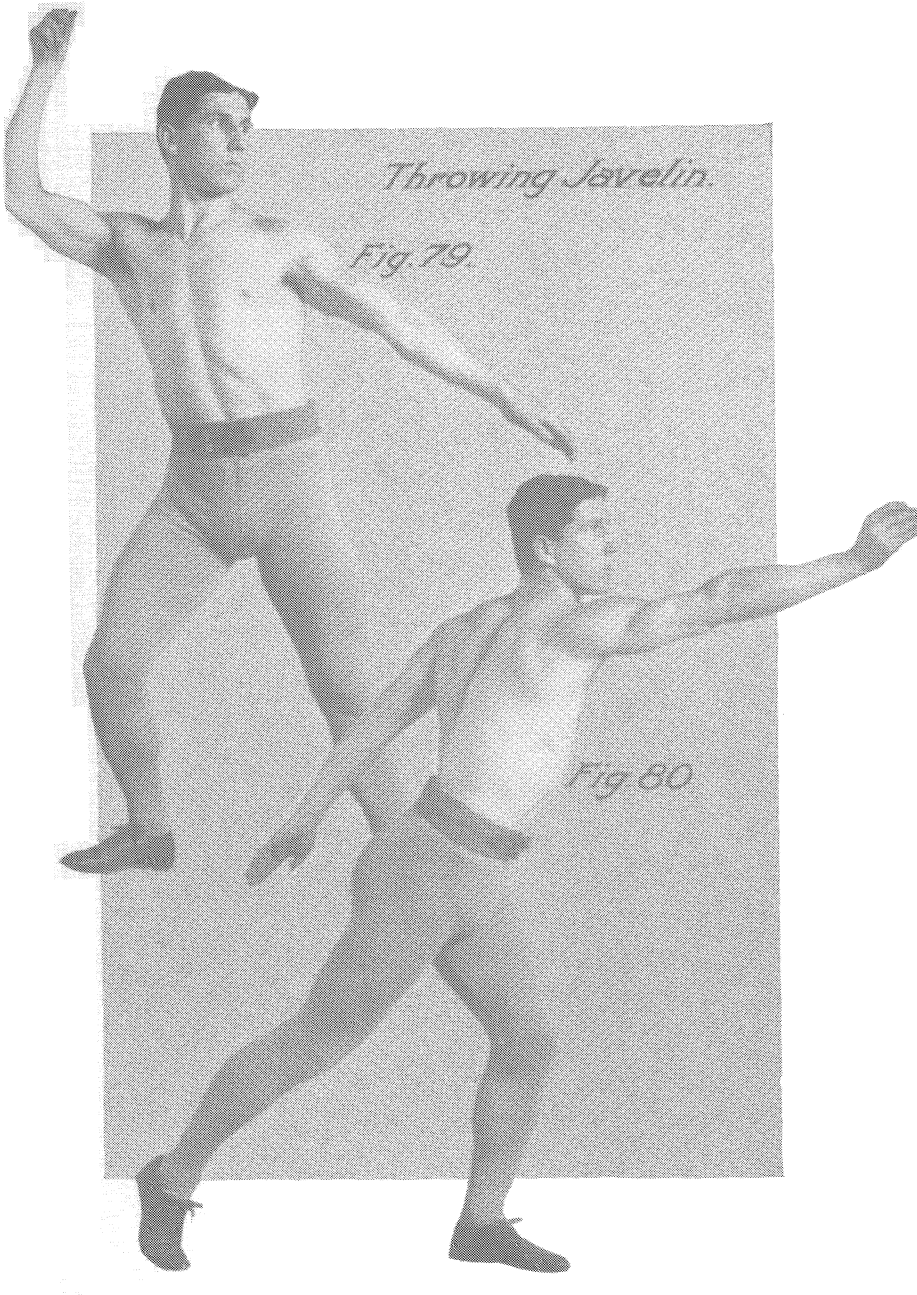
Position — Stand with the feet about twenty-four inches apart, weight thrown on to the right leg, left leg extended, right arm held at right angle above the shoulder, and the left arm held out from the side, as shown in Fig. 79.

Movement — Throw the right hand directly forward by flexing the wrist and forearm, and finally extending the whole arm and shoulder. Simultaneously with the making of this movement, straighten the right leg, throw the left arm backward, turn on the ball of the right foot, and throw the body forward so that most of the weight is supported by the left leg, as shown in Fig. 80. Return to the first position and repeat the movement. Try the same, throwing with the left arm.

Times — 10 — 25 — 40. Rate per minute, 10 — 20 — 30.

Caution — In this exercise care should be taken to throw the hand straight forward, and all of the other movements of the legs, trunk, and arms, should be correlated, so as to carry out this purpose.

Parts Affected — Flexors and extensors of the arms, upper chest, shoulders, waist, and abdominal muscles, and the calves, extensors of the legs and rotators of the spine to a lesser extent.


Throwing Javelin.
Fig. 79.
Fig 80

Exercise 41

GRAND SALAM

Position — Stand with feet together, arms hanging downward, and fingers touching in front of the body, as shown in Fig. 81A.

Movement — Incline the body slightly forward, throw the weight on to the right leg, and extend both arms and the left leg backwards about eighteen inches from the upright position. See Fig. 81B. From this attitude, sweep the arms outward, upward, and forward, and bring them down to a position where they are touching the sides of the head, with the hands extended as far forward and the left leg extended as far backward as possible. See Fig. 82. Bring the arms and left leg back to the first position and repeat the exercise, extending the right leg backward, and supporting the weight on the left leg.

Times — 5 — 10 — 20. Rate per minute, 8 — 16 — 24.

Caution — In this exercise, sink the body as low as possible by bending the advanced leg, and have the back of the body and rear leg make a continued straight line.

Parts Affected — The most powerful action in this exercise is brought to bear upon the extensors of the legs, and the erectors of the spine. At the same time the muscles of the shoulders, upper back, and neck are doing lots of work.

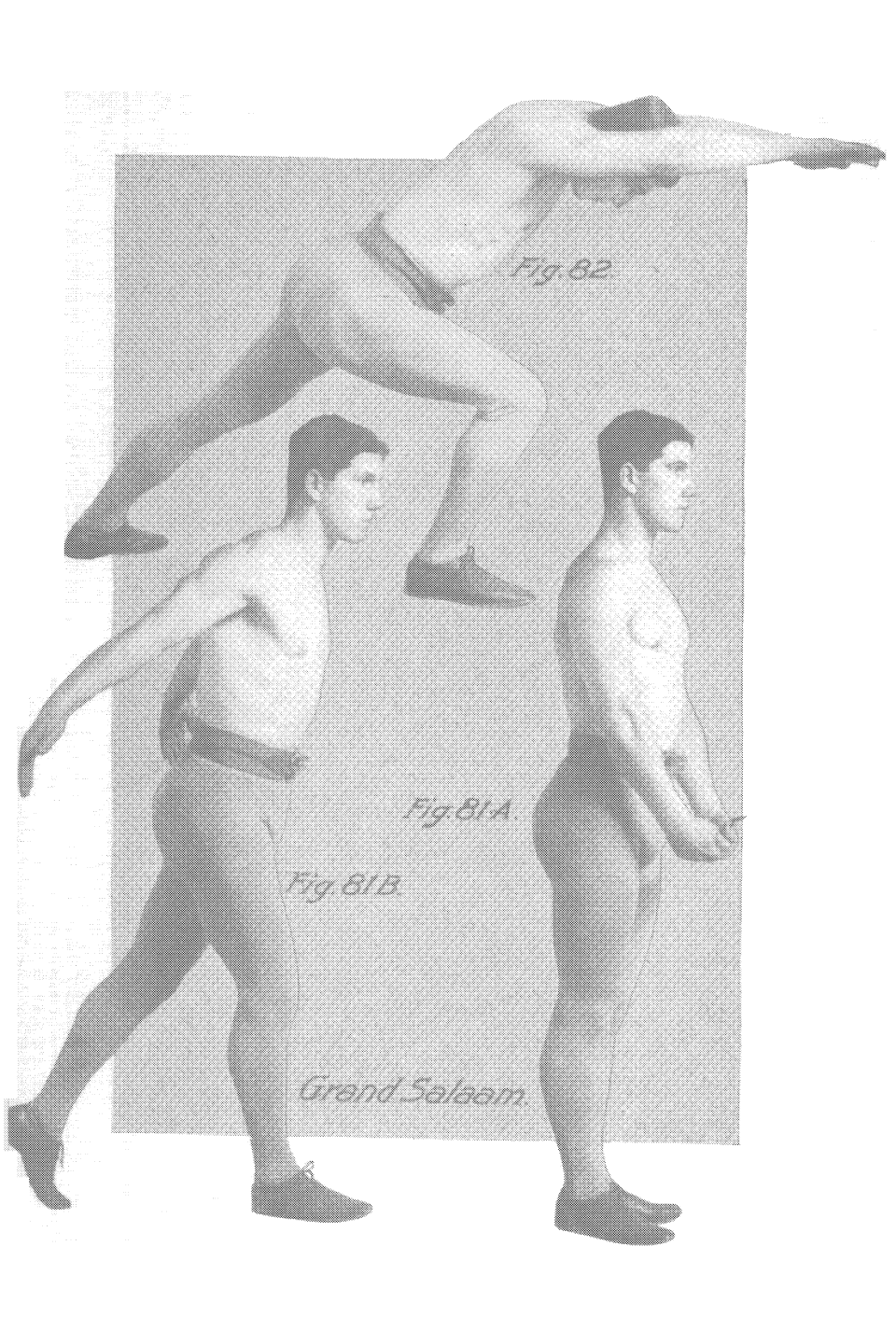


Fig. 82.
Fig. 81 A.
Fig. 81 B.
Grand Salaam.

Exercise 42

THE LONG DRIVE

Position — Stand with the weight supported largely on the right leg and foot, with the left foot touching the floor about eighteen inches to the left, turn the body around to the right, and carry the clenched hands up over the right shoulder, as shown in Fig. 83.

Movement — Swing the hands and arms downward and around, up into the position shown in Fig. 84, at the same time turning the body to the left, pivoting on the toes of the left foot, and throwing the weight largely on to the left leg. Return to the first position, and repeat the movement. Reverse the position, and try the same stroke to the right.

Times — 10 — 20 — 30. Rate per minute, 8 — 16 — 24.

Caution — Emphasize the downward stroke, and make the swing of the arms largely a body movement, and see that arms, body, and legs act in perfect harmony.

Parts Affected — Broad muscles of the back, oblique muscles of the abdomen and hips, rotators of the spine and thighs, and to a milder degree the muscles of the chest, arms, shoulders, and legs.

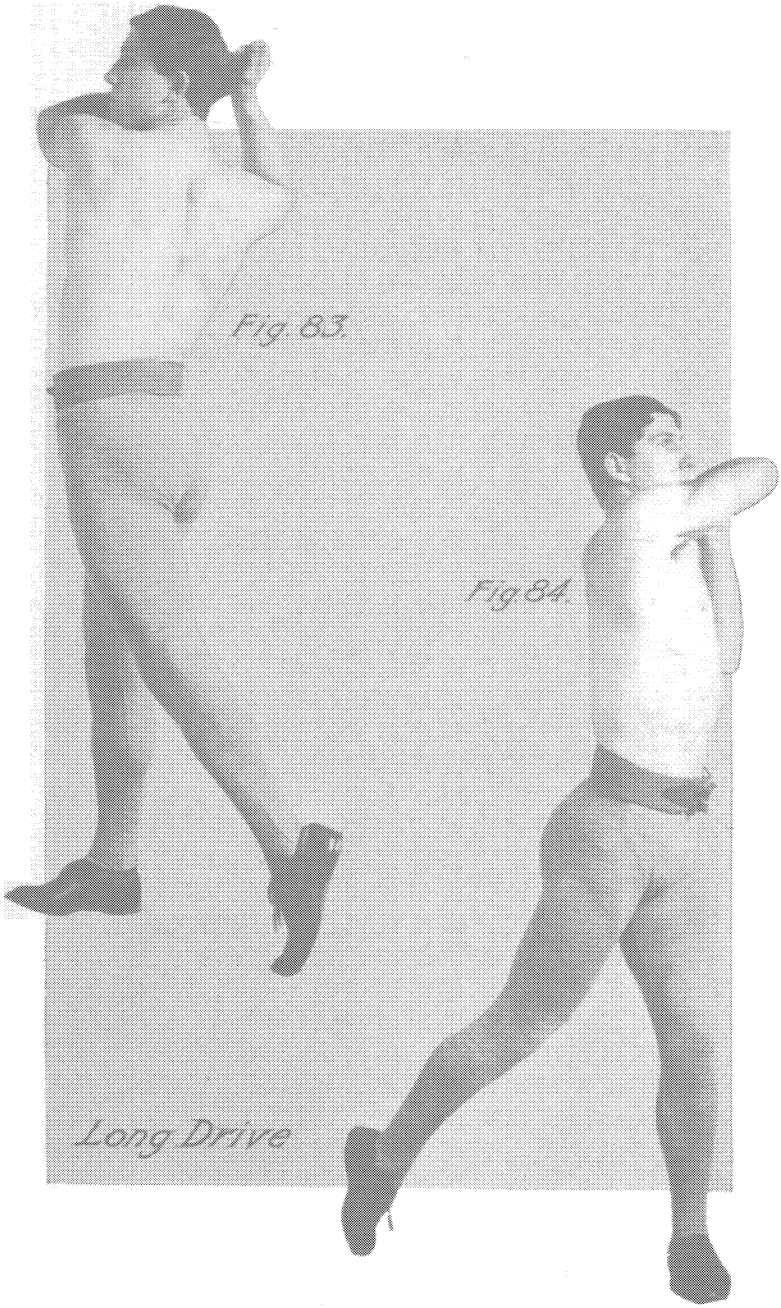


Fig. 83.
Fig. 84.
Long Drive

Exercise 43

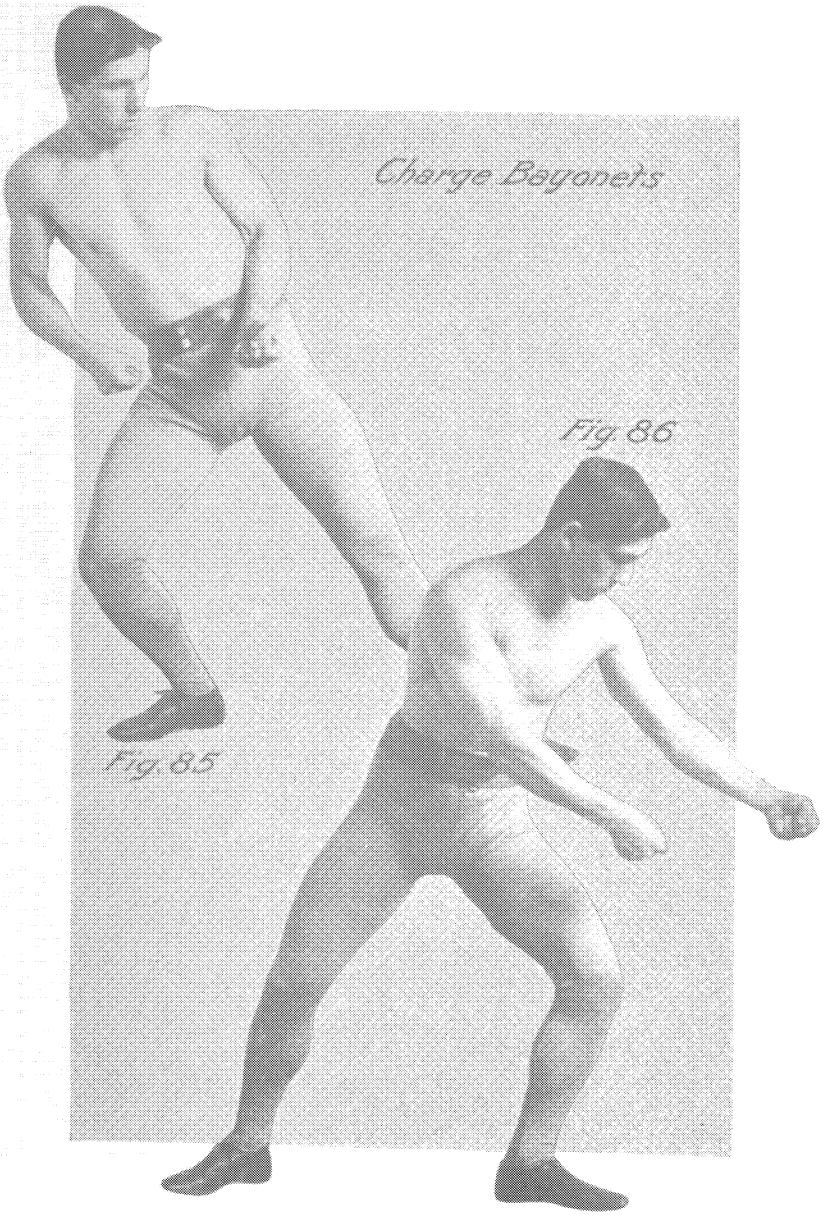
CHARGE BAYONETS

Position — Stand with feet about twenty-four inches apart, with the body inclined backward, and weight thrown on to the right leg, while the arms are slightly bent, and the hands clenched as though grasping a musket. See Fig. 85.

Movement — Thrust the hand and arms directly forward, at the same time extending the right leg, and inclining the body forward, and throwing the weight on to the left leg. See Fig. 86. Repeat. Reverse the position, and try the same movement, springing from the left leg.

Times — 20 — 40 — 80. Rate per minute, 16 — 32 — 48.

Parts Affected — Principally the extensors and adductor muscles on the outer and inner sides of the thighs, the calf muscles, the extensors and flexors of the arms, and the side walls of the abdomen and the back.


Charge Bayonets
Fig. 86
Fig. 85

Exercise 44

LOWER CHEST EXPANDER

Position — Stand with the feet about thirty inches apart, left leg advanced, right arm folded across the back, and left arm extended downward so that fingers touch the floor about fifteen inches beyond the advanced foot, as shown in Fig. 87.

Movement — Straighten the left leg, and bring the left arm upward and backward until it is fully extended over and back of the head as far as possible, as shown in Fig. 88. Return the left hand to the floor and repeat the movement. Do the same exercise with the right arm and leg advanced.

Times — 10 — 20 — 40. Rate per minute, 8 — 16 — 24.

Caution — In executing this movement, be sure and keep the supporting arm behind the back, and the extended arm as straight as possible. In bending backward, care should be taken not to bend too far back at first, and to have the supporting leg far enough in the rear to enable you to maintain a good balance.

Parts Affected — This exercise is especially valuable as a means of stretching the muscles of the abdomen, elevating the ribs, and expanding the lower part of the chest. In accomplishing this object, the muscles of the neck, chest, shoulders, back, arms, and legs are brought powerfully into action.

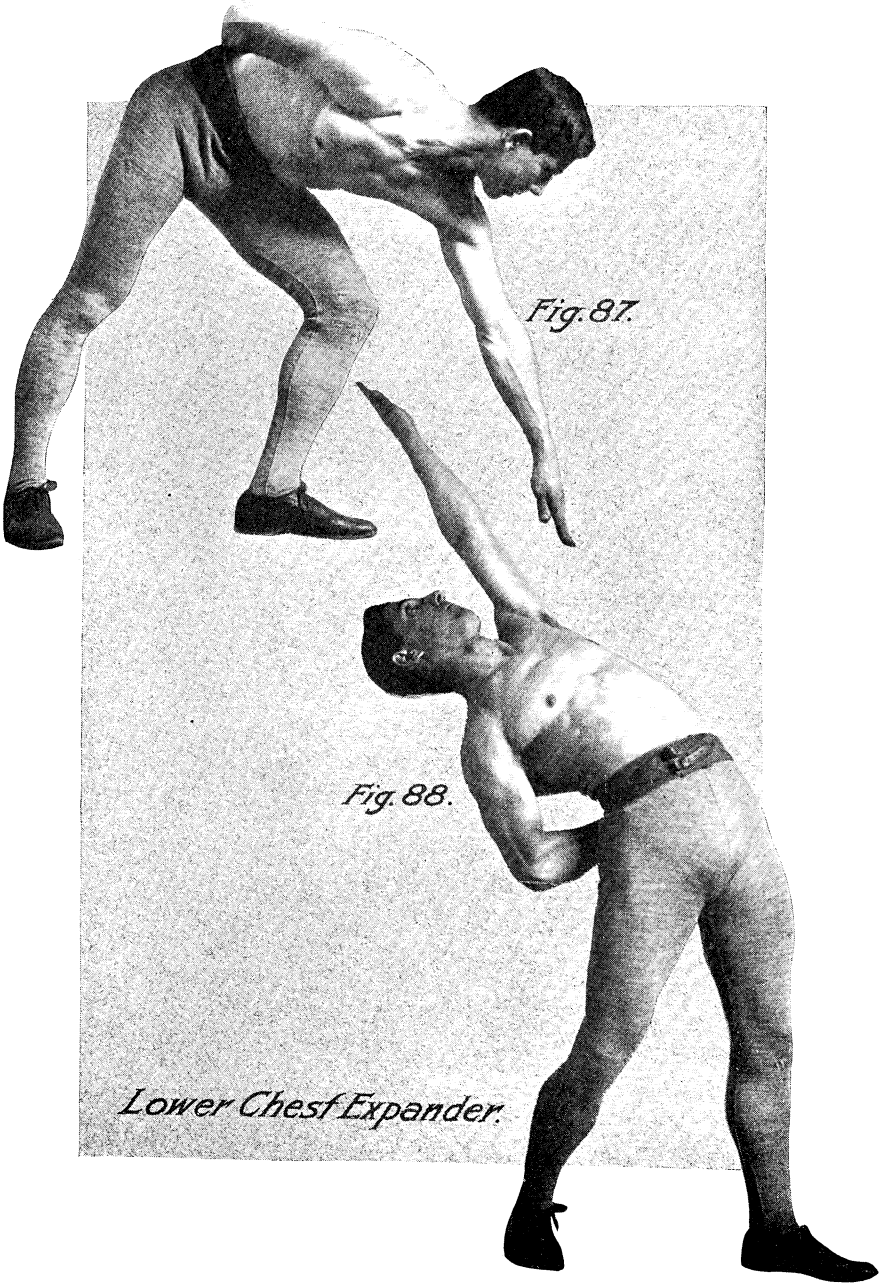


Fig. 87.

Fig. 88.

Lower Chest Expander.

Exercise 45

THROWING THE HAMMER

Position — Stand with the feet about eighteen inches apart, with the body twisted around to the right, and the arms extended downward and backward as though the hands were grasping the handle of a heavy hammer. See Fig. 89.

Movement — Swing the arms forward and upward over the head and left shoulder, then around the back of the head and forward again over the right shoulder, in a continuous circular movement. Repeat. See Fig. 90. Try the same movement, starting from the left side.

Times — 10 — 20 — 30 — 40 — 50 — 60 — 70 — 80 — 90 — 100. Rate per minute, 15 — 20 — 25 — 30.

Caution — In executing this exercise, try and pivot at the hips, swinging the body around in a circle, and making the circumference of the circle as large as it can easily be made without bringing too much strain on the muscles of the lower abdomen.

Parts Affected — Arms, shoulders, back, chest, abdomen, waist, hips, and legs — all in a mild degree.

Throwing the Hammer

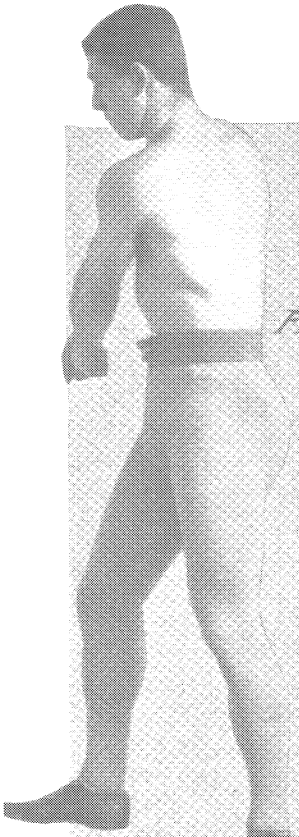


Fig. 89

Fig. 90

Exercise 46

MERCURY POISE

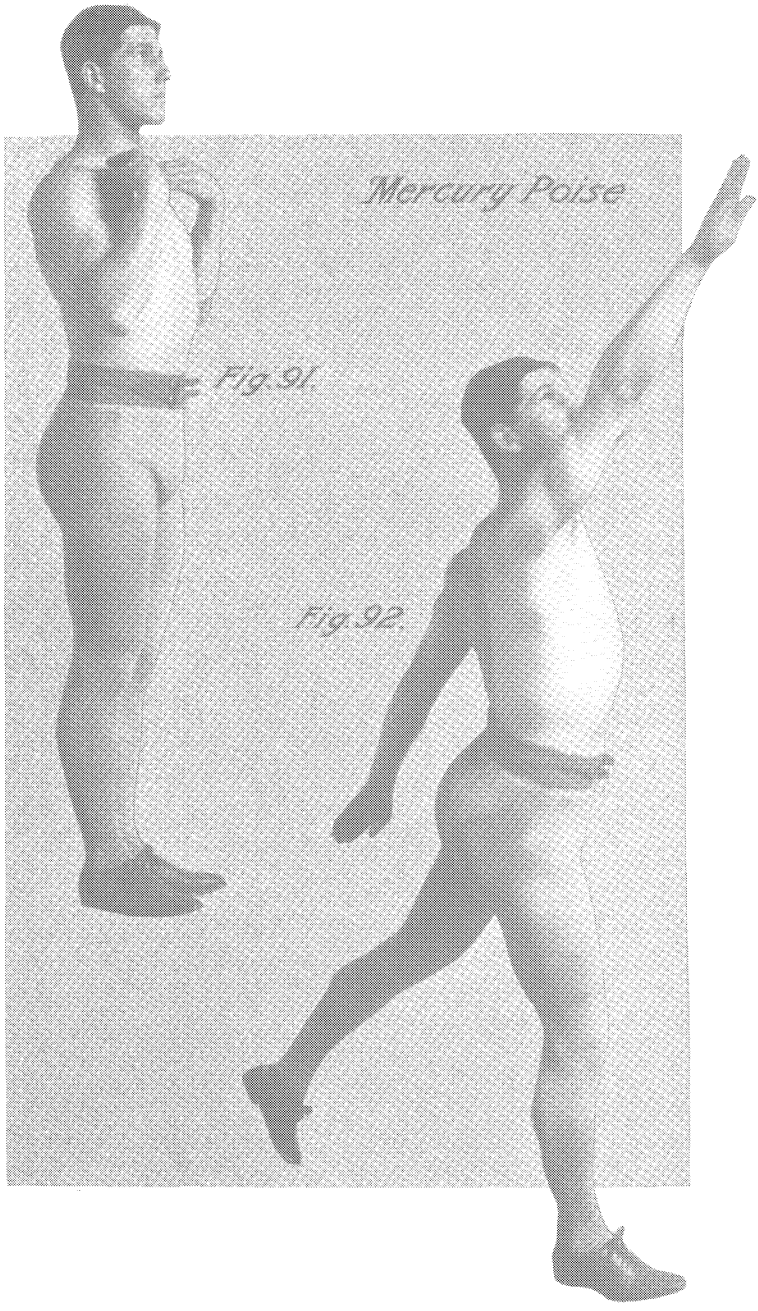
Position — Stand with feet together and arms bent, with fingers touching the collar-bone, as shown in Fig. 91.

Movement — Thrust the right arm forward and upward, and the left arm downward and backward, at the same time rise on the ball of the right foot and extend the left leg backward, in a line with the right arm, as shown in Fig. 92. Return to first position, and try the same exercise from the left foot, reversing the positions of the arms and right leg.

Times — 10 — 20 — 30. Rate per minute, 12 — 20 — 30.

Caution — In executing this exercise, stretch the extended arms and leg as far as possible, and try to hold your balance on the ball of the foot while in the extended position.

Parts Affected — Extensors and flexors of the thighs, calf muscles, shoulders, arms, and upper chest. An admirable exercise for giving poise and preventing undue contraction of the muscles.


Mercury Poise
Fig. 91.
Fig. 92.

Exercise 47

FIRE-ENGINE

Position — Stand with the feet about twelve inches apart, body erect, hands clenched, and held at the height of the eyes about fifteen inches apart, with elbows thrown backward on a line with the shoulders, as shown in Fig. 93.

Movement — Bring the hands down to the knees, straightening the arms, and flexing the trunk and legs at the same time. See Fig. 94. Now straighten the legs and back and bring the arms up to the starting position, and repeat the movement.

Times — 10 — 20 — 30. Rate per minute, 16 — 32 — 48.

Caution — Make the movements of the arms, back, and legs simultaneously, and be sure and throw back the elbows and expand the chest at the completion of every upward stroke.

Parts Affected — Principally the extensor muscles of the back and legs. The extensors, flexors, and rotators of the arms, and the muscles on the back of the neck, and above and between the shoulders are affected to a milder degree.

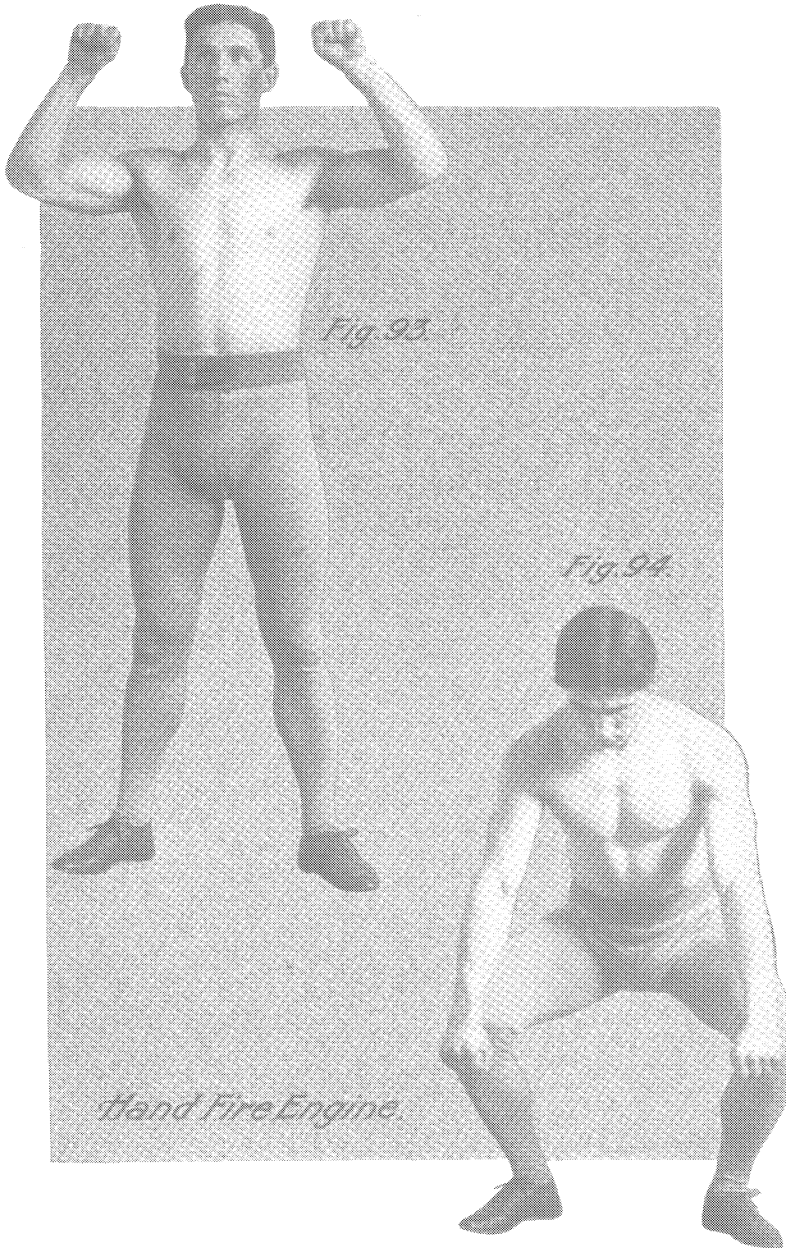


Fig. 93
Fig. 94
Hand Fire Engine.

Exercise 48

OVERHAND BOWLING

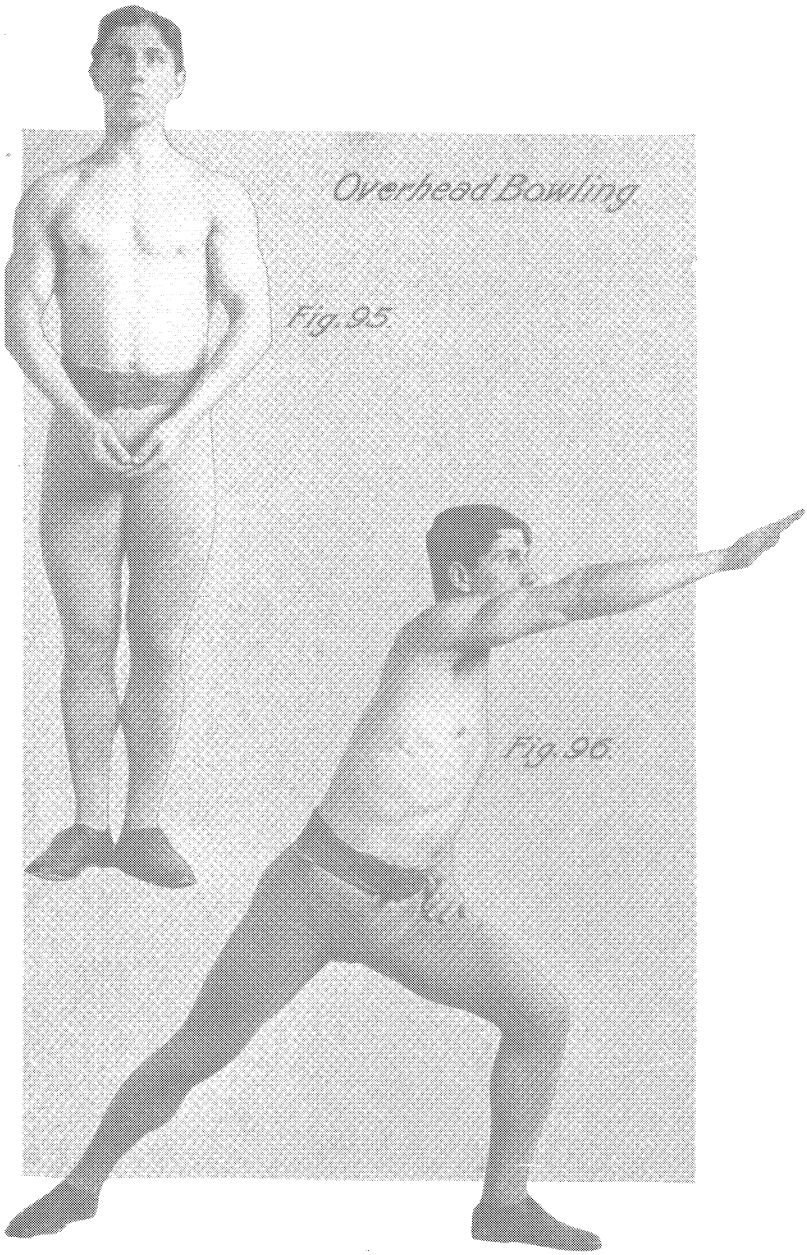
Position — Stand with heels together, body erect, and fingers united in front, as though holding a ball. See Fig. 95.

Movement — From the above position, lunge outward with the left leg to the left about thirty-six inches, at the same time swing the right arm, held straight, upward and over across the front of the face, into the position shown in Fig. 96. Return to the first position, and repeat the exercise. Try the same movement with the left arm, lunging to the right.

Times — 10 — 25 — 40. Rate per minute, 10 — 20 — 30.

Caution — In lunging to the left side, place the left hand on the left thigh for support, and turn the body to the left, and incline it forward so that it will be on a line with the extended right leg. Bring the bowling arm to a sudden stop when it is about level with the shoulders, and spring back into the first position from the ball of the advanced foot.

Parts Affected — Principally the extensor muscles and calf of the lunging leg, the adductors of the stationary leg, and the muscles of the shoulders, upper chest, arms, and abdomen.


Overhead Bowling.
Fig. 95.
Fig. 96.

Exercise 49

AMERICAN EAGLE

Position — Stride forward with the left leg so that the feet are about forty inches apart, at the same time lean forward with body and extend the arms downward, until the fingers touch the floor with the hands together, about three inches in front of the left foot, as shown in Fig. 97.

Movement — From this position, while body and head are still inclined, raise the arms outward and upward as far as possible, as shown in Fig. 98. Allow the hands to descend to the floor again, and repeat the movement. Try the same with the right foot in advance.

Times — 10 — 20 — 30. Rate per minute, 21 — 28 — 35.

Caution — Keep the arms fully extended, bring them upward and outward quickly, and frequently resume the upright position.

Parts Affected — The extensors of the legs, and erector spinal muscles in supporting the weight of the body, but the posterior muscles of the shoulders, back of the neck, extensors of the arms, and muscles between the shoulder-blades are most actively engaged.

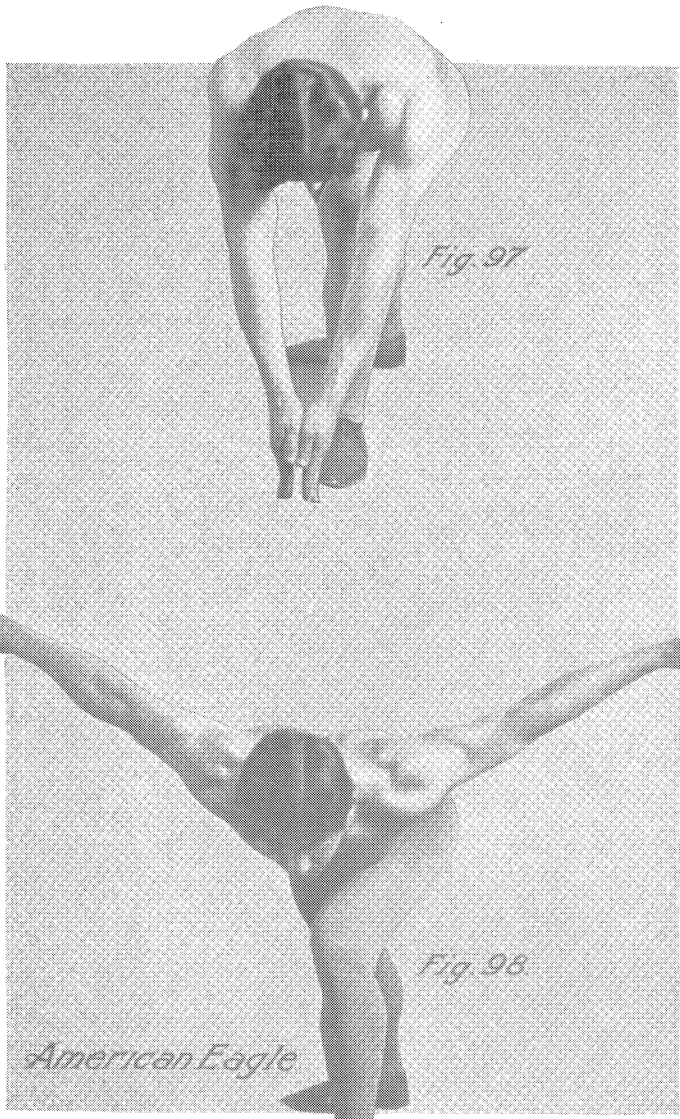


Fig. 97

Fig. 98

American Eagle

Exercise 50

THE LONG PASS

Position — Stand with the feet about twenty-four inches apart, with the right arm and hand extended outward and backward, as though grasping a football, and the left arm extended to help keep the balance, as shown in Fig. 99.

Movement — While the right arm is held rigidly straight, swing it around diagonally forward and upward to the left, turning at the same time on the right foot and throwing the weight on to the left leg, as shown in Fig. 100. Return to the first position, and repeat the movement. Try the same exercise with the left arm, turning on the left foot.

Times — 10 — 25 — 40. Rate per minute, 10 — 20 — 30.

Caution — In executing this exercise, the left arm must be swung backward and downward at the same time the right arm is swung forward, and the whole body, including the right hip and right thigh, should be made to revolve over a quarter way around on the left hip joint.

Parts Affected — Middle chest, shoulders, and arms, and oblique muscles of the abdomen. Rotators of the thighs, and extensor muscles of the legs and feet, located on the front of the thighs and the calves.

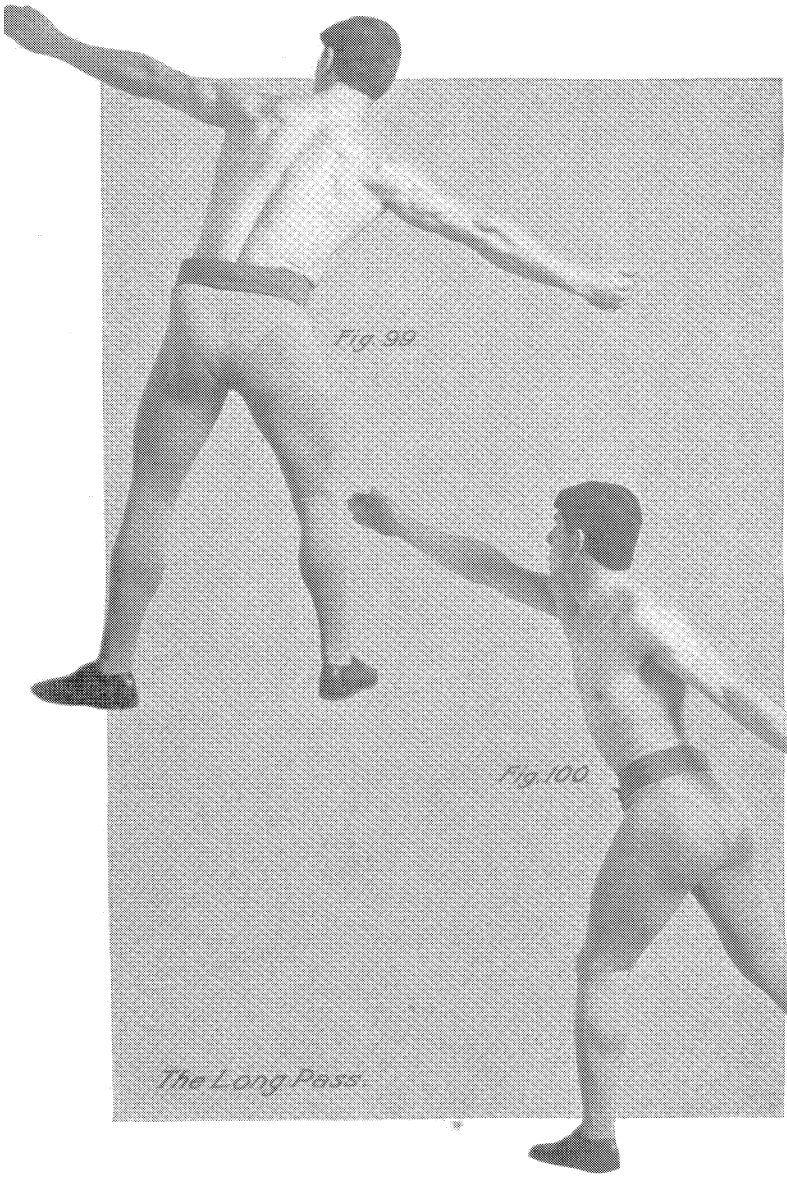


Fig. 99

Fig. 100

The Long Pass.

Exercise 51

SAWING WOOD

Position — Stand with feet about twenty-four inches apart, arms bent at right angles, with hands clenched and held fourteen inches apart, as shown in Fig. 101.

Movement — Extend the arms downward until the hands come within six inches of the floor, with head and trunk inclined forward and knees bent, as shown in Fig. 102. Now bring the body to the upright position by raising the head and trunk and straightening the legs, and draw the hands up above the belt at the waist. Repeat.

Times — 10 — 30 — 50. Rate per minute, 16 — 32 — 48.

Caution — Double the fists as though grasping a hand wood-saw, and bend and straighten the back and legs at the same time. The arms are bent as the legs are straightened, and the legs are bent as the arms are straightened.

Parts Affected — Principally the extensor muscles of the back and legs. If the movements are done energetically, the muscles of the arms, chest, neck, shoulders, and abdomen are also brought into mildly vigorous action.

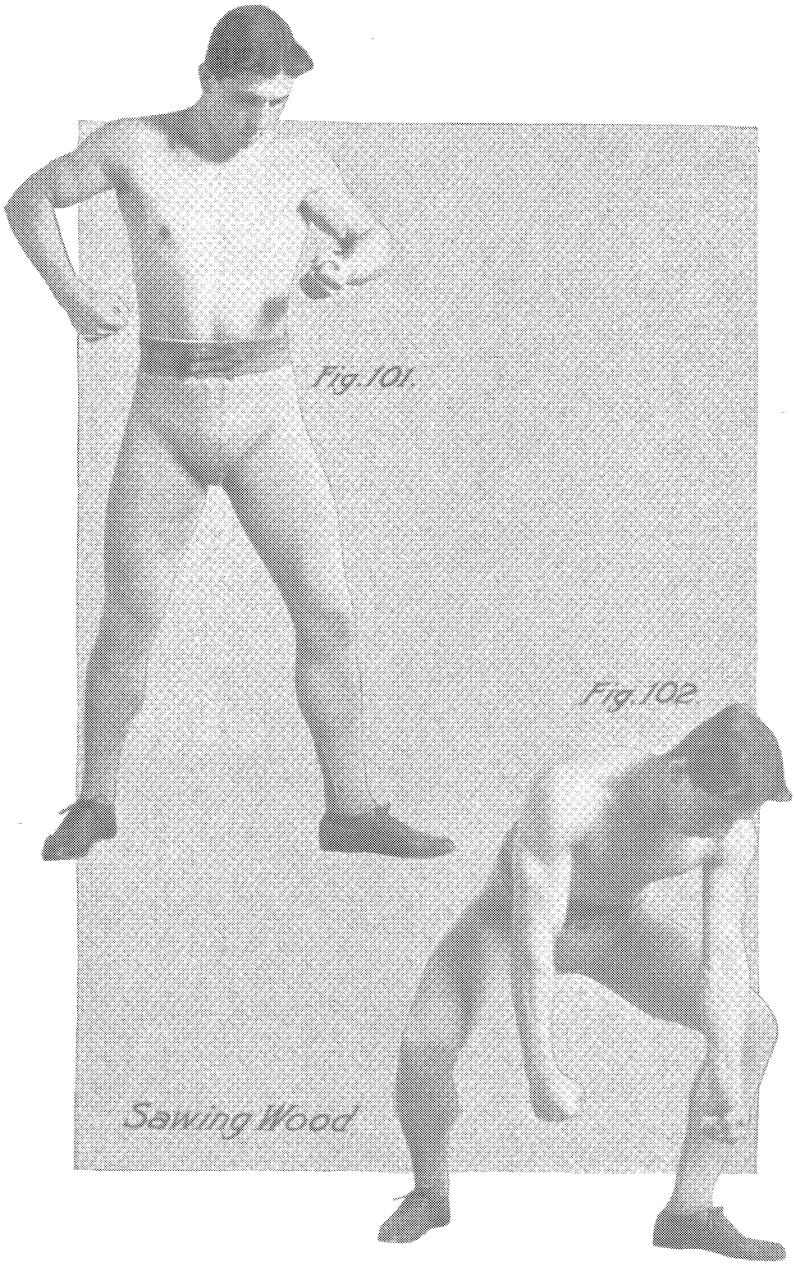


Fig. 101.
Fig. 102.
Sawing Wood

Exercise 52

HORIZONTAL BALANCE

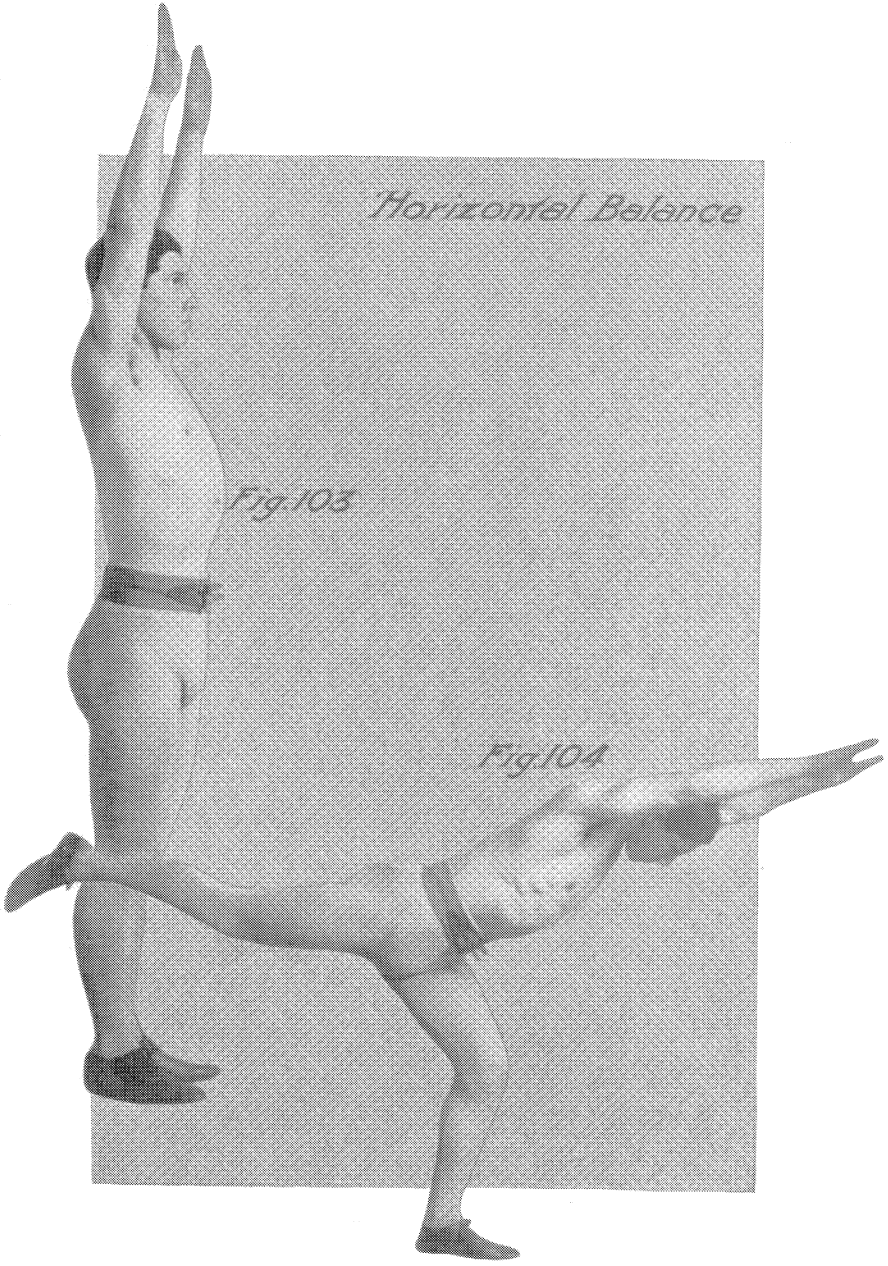
Position — Stand with feet together, body erect, and arms extended vertically upward over the head, as shown in Fig. 103.

Movement — While maintaining the same straight, extended position with the arms, trunk, and right leg, bend *slowly* forward, balancing the weight on the left leg, until the whole body assumes nearly a straight line parallel with the floor, as shown in Fig. 104. Now return *slowly* to the original position, and repeat, balancing on the right leg and extending the left backwards, etc.

Times — 5 — 10 — 15. Rate per minute, 4 — 8 — 12.

Caution — In doing this exercise, the greatest stress should be put upon the effort to attain a straight horizontal position. This may be best achieved by bending the knee of the supporting leg, and trying to elevate the hands and the foot of the extended leg at the same time.

Parts Affected — The greatest strain in this exercise comes upon the extensor and flexor muscles on the thigh, and upon the calf and ankle of the supporting leg. The extensors of the arms, back, and thigh, and the muscles of the buttocks and shoulders are also brought into great and prolonged activity in their efforts to hold up the body and maintain a line parallel with the floor.


Horizontal Balance
Fig 103
Fig 104

Exercise 53

HURRAH

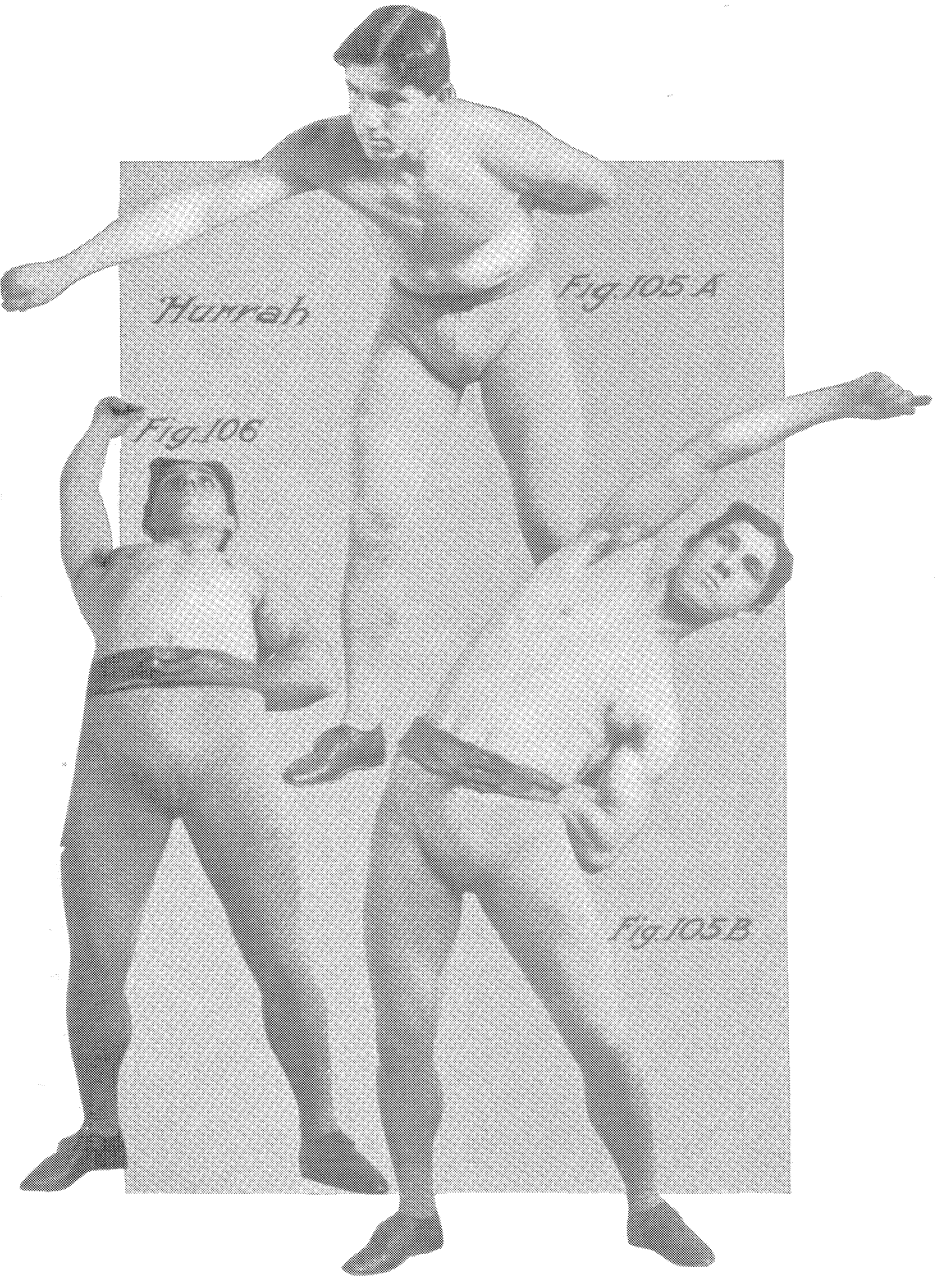
Position — Stand with the feet about twenty-four inches apart, the left forearm resting across the back, and the right arm extended well forward to the right. See Fig. 105A.

Movement — From this position, swing the right arm around to the left up over the head (see Fig. 105B), and back of the head and body, as shown in Fig. 106, around to the position of the hand at starting. See Fig. 105A. Repeat the movement. Place the right forearm behind the back, and swing in the opposite direction with the left arm.

Times — 10 — 20 — 30. Rate per minute, 8 — 16 — 24. Do not make too large a circle at first.

Caution — Keep the extended arm as straight as possible, pivoting largely from the hips and loins, so as to make a continuous circle with the body as well as the arms.

Parts Affected — The hips, waist, abdomen, loins, and thighs principally, but the muscles of the chest, shoulders, upper and lower back and arms are also brought into considerable activity.


Hurrah
Fig.105 A
Fig.106
Fig.105 B

Exercise 54

ROWING

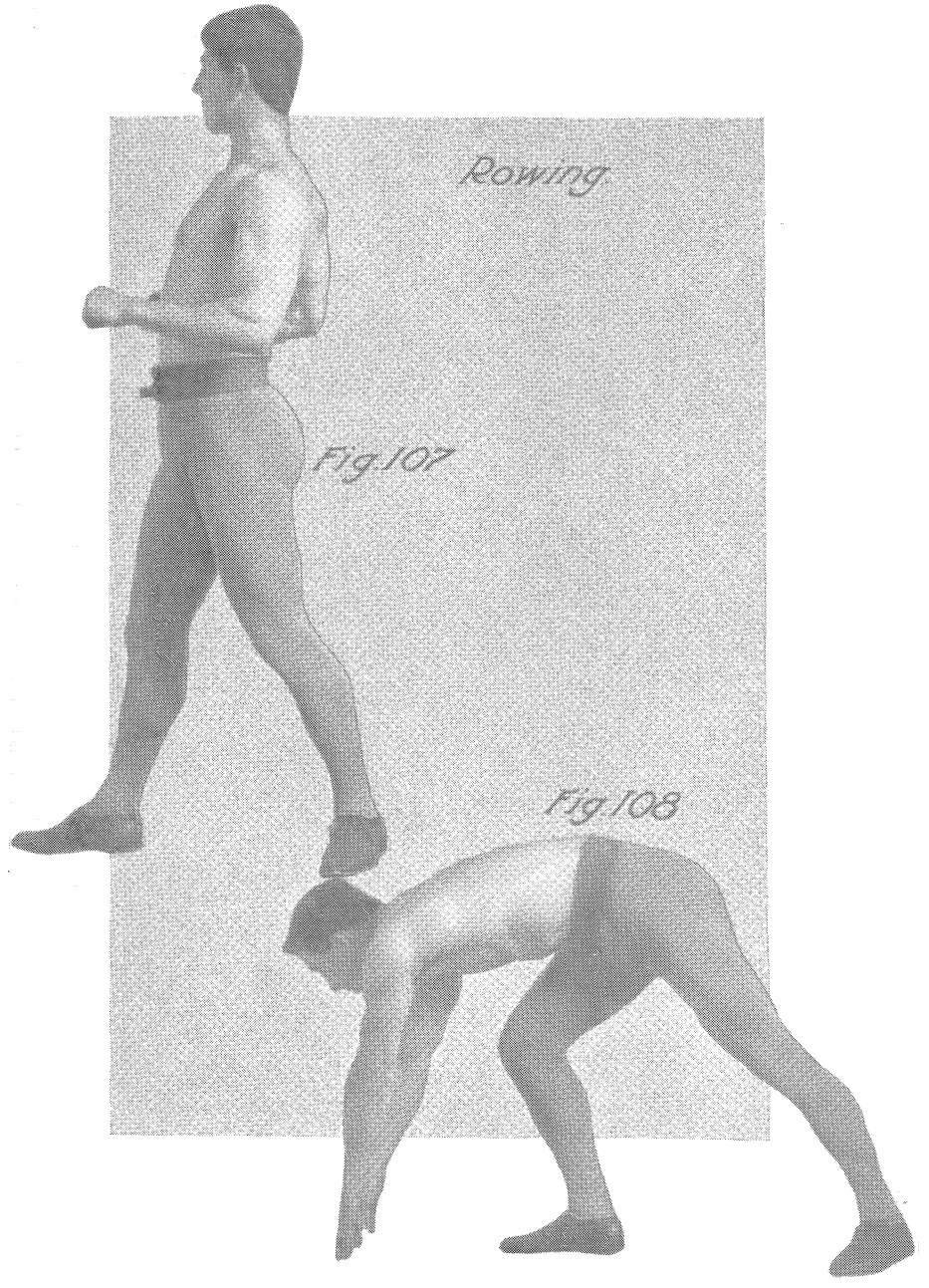
Position — Stand facing to the right with feet about twenty-four inches apart, right leg advanced, and the arms held at the sides while bent at a right angle, as shown in Fig. 107.

Movement — Lunge forward, throwing the weight of the body on to the right leg, bending the body, and extending the arms until the fingers touch the floor about twelve inches in front of the right foot, as shown in Fig. 108. Now return vigorously to the starting position, as though lifting a weight or pulling an oar. Repeat. Try the same exercise, facing to the left with the left foot advanced.

Times — 10 — 20 — 50. Rate per minute, 16 — 24 — 36.

Caution — Be sure and keep both feet on the floor, bending the front leg as the body swings forward, and the rear leg as the arms are brought back. Energize the upward movement, and make it as steady and rhythmical as possible.

Parts Affected — The muscles that erect the spine. The broad muscles of the back that pull up the arms, and the muscles of the hips, and back and front of thighs and legs.


Rowing.
Fig 107
Fig 108

Exercise 55

ROCKING THE BOAT

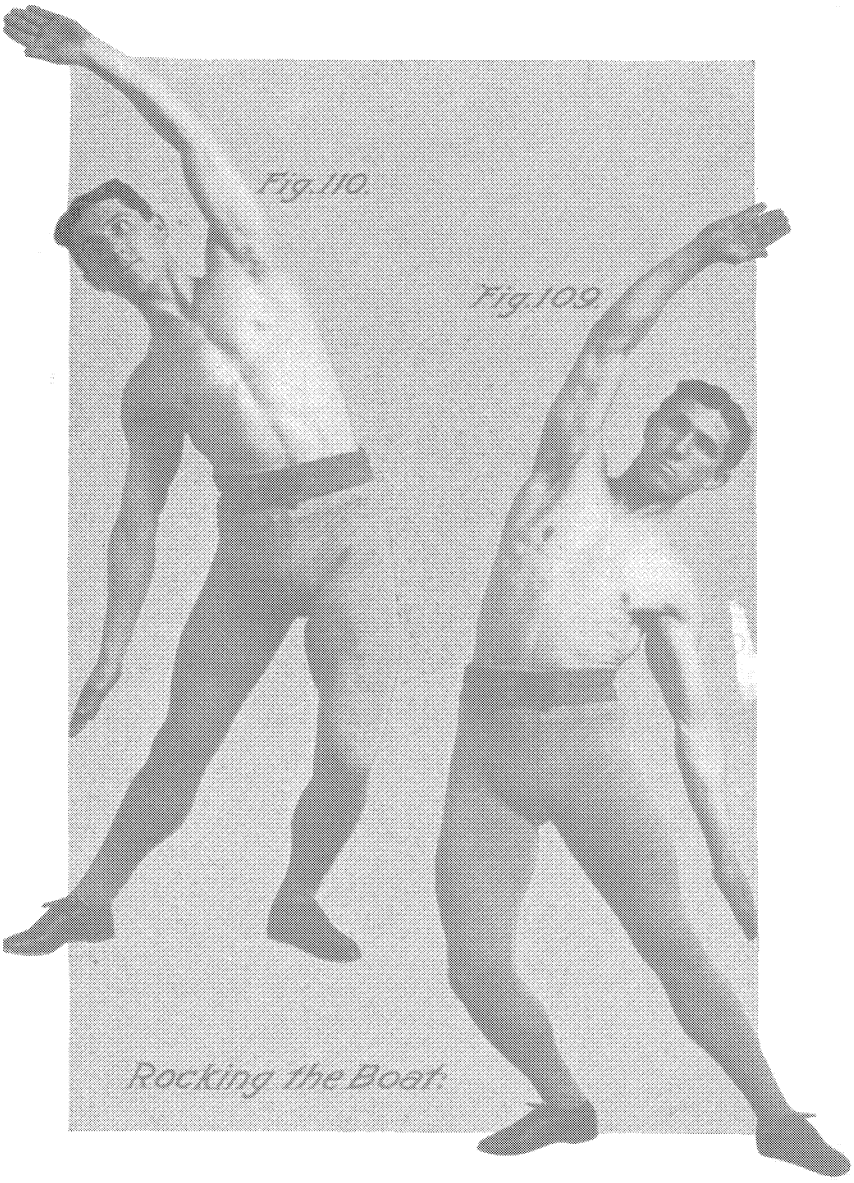
Position — Stand with the feet twenty-four inches apart, with right arm extended upwards, the left arm downward, and the weight of the body thrown on to the right leg, as shown in Fig. 109.

Movement — Bring the right arm downward, and carry the left arm upward, at the same time swaying the hips to the left side, and shifting the weight of the body on to the left leg, as shown in Fig. 110. Repeat the exercise, swaying from side to side.

Times — 20 — 40 — 60. Rate per minute, 30 — 40 — 60.

Caution — Check the downward arm in its descent before it reaches the leg, and keep the arm that is extended upward as straight as possible, so that the swaying movement of the body will give the desired elevation to the ribs.

Parts Affected — The shoulders, upper arm, sides of the neck, and upper chest. Muscles about the hips, upper thighs, and lower leg. Especially valuable as a means of lifting the ribs and increasing the breathing capacity.



Rocking the Boat.

Exercise 56

RESTORATION

Position — Stand with the feet together, face downward, arms extended downward, and backs of the hands touching, as shown in Fig. 111A.

Movement — Raise the hands, arms, and elbows, keeping the backs of the hands together until they pass the chest and face. See Fig. 111B. Then continue the movement upward, until the hands separate above the head with face turned upward (see Fig. 112), when they should be brought downward and outward in a large circle to the starting-point, shown in the first position. Repeat the movement.

Times — 10 — 20 — 30. Rate per minute, 8 — 16 — 24.

Caution — In this movement, begin to inhale as the arms are raised, and take in as much air as possible by the time the hands are above the head, then allow the breath to go out slowly as the arms descend.

Parts Affected — This exercise brings into gentle and sustained action the muscles of natural and forced respiration.

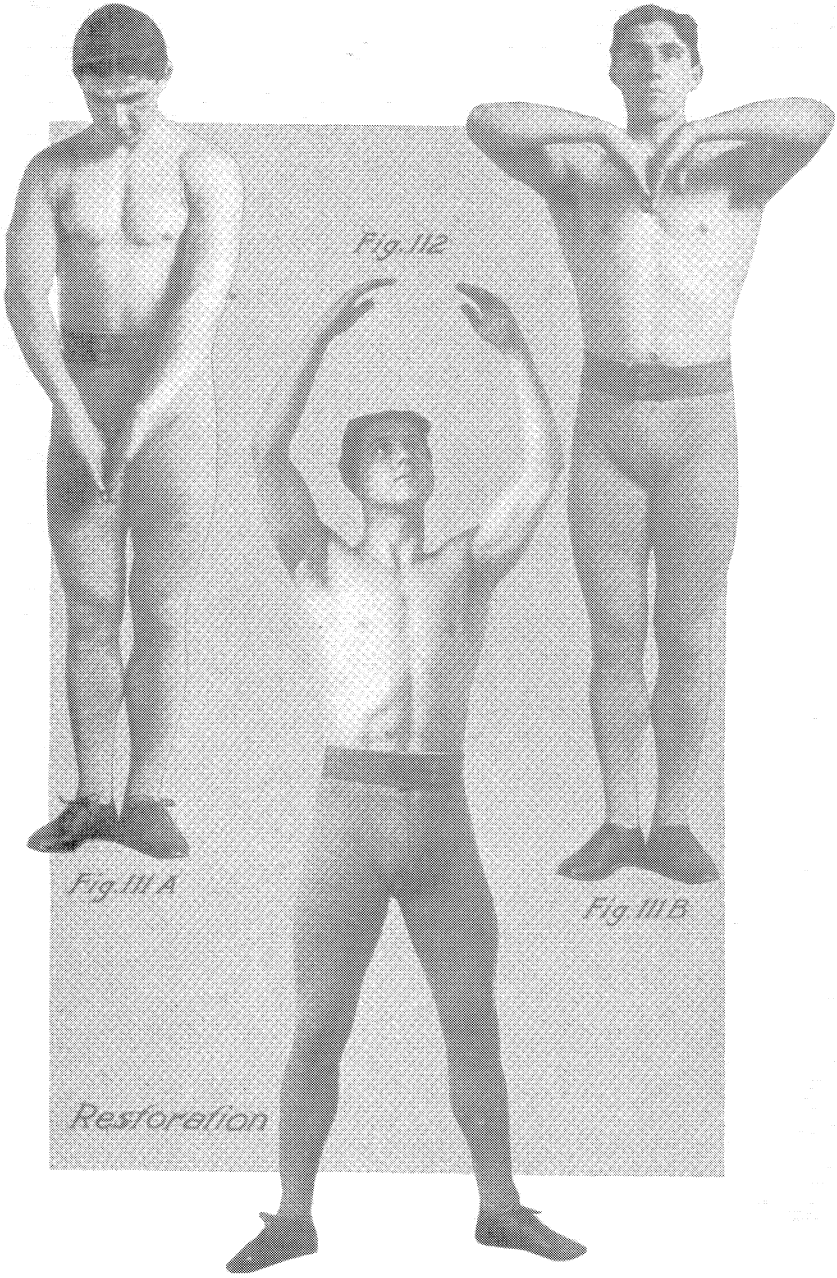


Fig. 112
Fig. 111 A
Fig. 111 B
Restoration

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